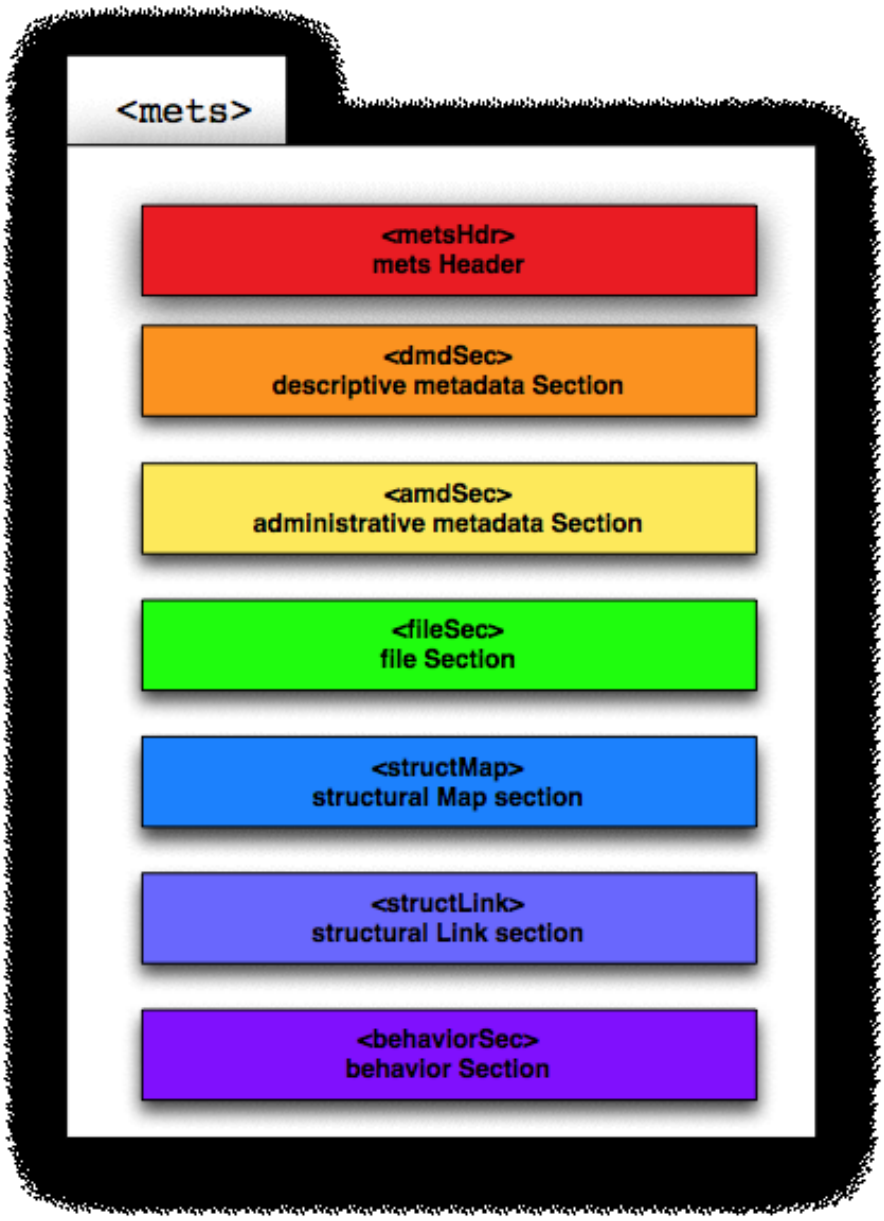
<METS>
METADATA ENCODING AND TRANSMISSION STANDARD:
PRIMER AND REFERENCE MANUAL



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PUBLIC DOMAIN

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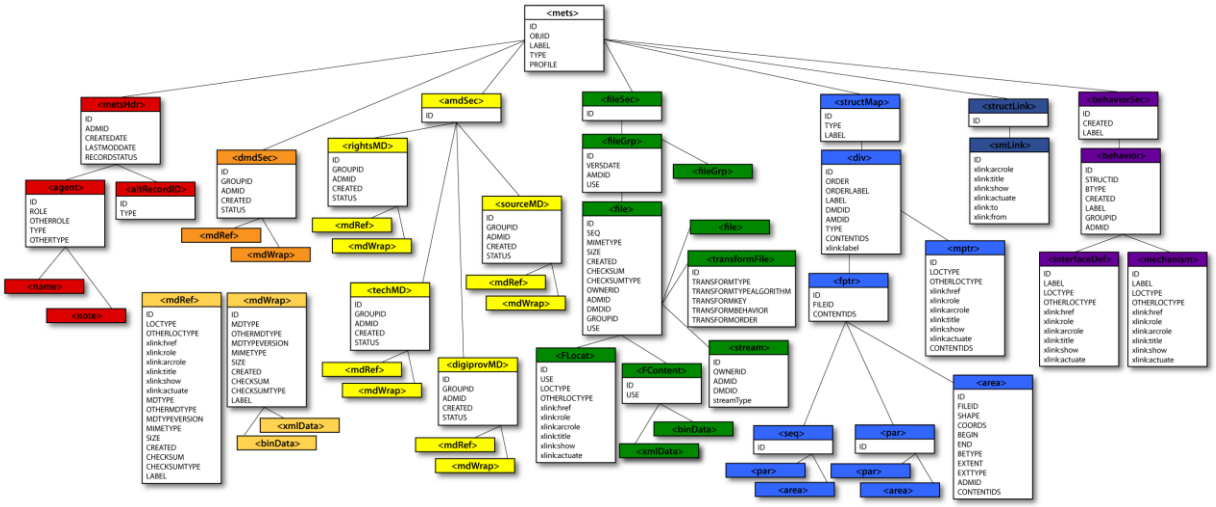


FOREWORD

One of the most often expressed requests received by the METS Editorial Board during its relatively short history has been for more extensive technical documentation and better examples of METS instances. As institutions which initially implemented METS have gained more experience with it, the feasibility of creating useful documentation has been greatly increased. Targeted for prospective users of METS, but also for developers, metadata analysts, and technical managers, this documentation has been written by a small subgroup of the METS Editorial Board. Special thanks go to Rick Beaubien, University of California at Berkeley; Susan Dahl, University of Alberta; Nancy Hoebelheinrich, Stanford University; Jerome McDonough, University of Illinois, Urbana Champaign; Merrilee Proffitt, OCLC Programs and Research; Taylor Surface, OCLC; and our editor, Cecilia Preston, Preston and Lynch. A special thank you to all the DLF Directors with whom we have worked: Dan Greenstein, David Seaman and Peter Brantley. And to all of our reviewers for their time, effort and valuable comments, especially Jenn Riley, University of Indiana; Nate Trail, Library of Congress; Eric Stedfeld, NYU; Philip Schreur, Jerry Persons and Rachel Gollub at Stanford; Michael Conkin and Guilia Hull at UC Berkeley; and Arwen Hutt, UC Santa Barbara.

At this time this document has been formatted for print publication. There will also be an online version to reference which will contain updates over time. Questions about the material can be directed to the METS Editorial Board.

HOW TO USE THIS PUBLICATION

A wide range of readers were envisioned as this document was being planned, written and edited. As such, each chapter as presented can often stand alone.

Chapter 1 serves as its Introduction, providing some general answers to the background and development of METS. Chapter 2 is designed as an overview and basic tutorial for the use of METS. It describes how to create a METS document. Chapter 3 provides more specific documentation about the various elements within the METS schema. The elements are organized in the order they appear in the METS.xsd. Chapter 4 is targeted to the developer and XML aficionado who needs to know how XML specific methods are incorporated and designed to be used within the XML binding of the schema. Chapter 5 provides an overview of the use of external schemas with METS for the different categories of metadata that can be partitioned within it including descriptive and administrative metadata. The reader is directed to other sources of information for more specifics regarding the use of each schema that is endorsed by the METS Editorial Board. Chapter 6 includes introductory material about METS profiles, but once again points to the more specific information found on the METS website about how to create

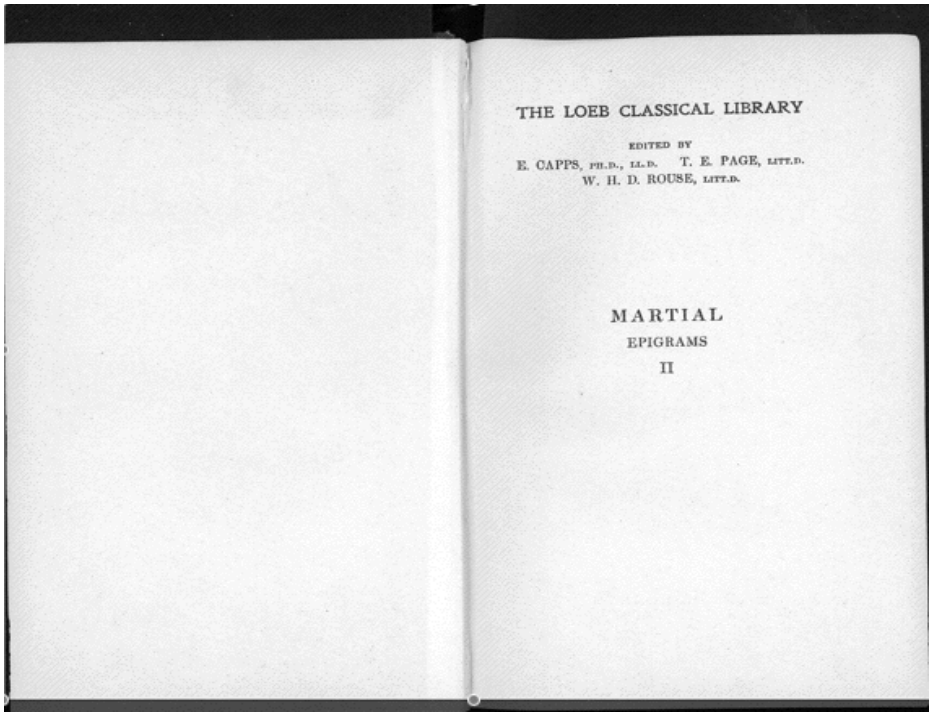
METS profiles along with the list of registered profiles, and the sample instance documents that are required as part of registering a METS profile. Appendix A contains a full METS document example drawn from a few scanned page image files from Martial, *Epigrams* (2v.) London, W. Heinemann; 1919-20. Appendix B contains three sets of tables: ComplexTypes, Elements and Attributes arranged in alphabetical order for quick reference.

BEFORE THERE IS A METS DOCUMENT

As with any large-scale project there are many decisions and processes to be worked through before implementation begins in earnest. The writing of this document was no exception. One of the early challenges was to find something that could be used throughout as an example of the many elements and attributes. Not a small order when the most applicable use for some elements would be audio/video files, which do not make for good text-based examples. Our solution, as seen in the full METS document, in Appendix A, is based on Martial's *Epigrams* Volume II which is part of the Loeb Classical Library. The sample page images below include the Series Title Page (image 1), the Title Page for this volume (image 2), and two two-page images of text (images 3-4).

This volume provides a relatively simple text, capable of illustrating many of the more complex functions of METS, for example the parallel file and sequence of files elements. Note in images 3-4 that the text on the verso is in Latin and English on the recto. A page turner application could present each even numbered page of text in sequence, thus presenting only the Latin text to the reader, or the pages two up as in the bound volume so that the reader can examine both the Latin and English simultaneously using the parallel file element. At the bottom of image 3 epigram VIII carries over to image 4. If retrieval of only this epigram is requested then the ability to present only the relevant area of those page images could be employed using the area element. But if the document had been encoded using TEI or some other text format the file structure could be such that each epigram is its own file and then the split across multiple pages would not be an issue.

The full METS example document includes all of the relevant files, using the <mdWrap> element. This allows the reader to see everything associated with this METS document. In most 'real-world' applications the <mdRef> element would be implemented for most of these sections, which are shown here in various typeface colors to aid the reader in identifying the actual METS code and to distinguish other schemas called upon to identify/describe the example document files, etc.


THE LOEB CLASSICAL LIBRARY

EDITED BY

E. CAPPS, PH.D., LL.D. T. E. PAGE, LITT.D.

W. H. D. ROUSE, LITT.D.

MARTIAL

EPIGRAMS

II

Image 1

MARTIAL

EPIGRAMS

WITH AN ENGLISH TRANSLATION BY

WALTER C. A. KER, M.A.

SOMETIME SCHOLAR OF TRINITY COLLEGE, CAMBRIDGE
OF THE INNER TEMPLE, BARRISTER-AT-LAW

IN TWO VOLUMES

II

LONDON : WILLIAM HEINEMANN
NEW YORK : G. P. PUTNAM'S SONS
MCMXXVII

Image 2

VI

Archetypis vetuli nihil est odiosius Aucti
(ficta Saguntino cymbia malo luto),
argenti furiosa sui cum stemmata narrat
garrulus et verbis mucida vina facit:
"Laomedonteae fuerant haec pocula mensae:
ferret ut haec, muros struxit Apollo lyra.
hoc cratere ferox commisit proelia Rhoetus
cum Lapithis: pugna debile cernis opus.
hi duo longaevo censentur Nestore fundi:
pollice de Pylio trita columba nitet.
hic scyphus est in quo misceri iussit amicis
largius Aeacides vividiusque merum.
hae propinavit Bitiae pulcherrima Dido
in patera, Phrygio cum data cena viro est."
miratus fueris cum prisca toreumata multum,
in Priami calathis Astyanacta bibes.

VII

Hoc agere est causas, hoc dicere, Cinna, diserte,
horis, Cinna, decem dicere verba novem?
sed modo clepsydras ingenti voce petisti
quattuor. o quantum, Cinna, tacere potes!

VIII

Principium des, Iane, licet velocibus annis
et renoves voltu saecula longa tuo,

[1] In the battle between the Lapithae and the Centaurs.
[2] Achilles: *cf.* Hom. *Il.* ix. 203.

VI

Than old Auctus' antiques nothing is more odious—I prefer drinking vessels moulded from Saguntine clay —when he prates of the crazy pedigrees of his silver plate, and by his chattering makes the wine vapid. "These are cups that once belonged to Laomedon's table: to win these Apollo by his harp-playing built the walls of Troy. With this mixing-bowl fierce Rhoetus joined battle with the Lapithae:[1] you see the workmanship is dinted by the fight. These two goblets are valuable because of aged Nestor: the dove is burnished by the rubbing of the Pylian thumb. This is the tankard in which the grandson of Aeacus[2] ordered a fuller draught and stronger wine be mixed for his friends. In this bowl most beautiful Dido pledged Bitias when her banquet was given to the Phrygian hero."[3] When you have much admired these ancient chasings, in Priam's cups you will drink Astyanax.[4]

VII

Is this your pleading of causes, is this eloquence, Cinna, in ten hours, Cinna, to say nine words? And just now in loud tones you asked for four water-clocks![5] Oh, what store of silence, Cinna, you possess!

VIII

Albeit thou, Janus, givest their beginning to the flying years, and dost with thy visage renew the

[2] Aeneas: *cf.* Verg. *Aen.* i. 738.
[4] *i.e.* something very young and immature. Astyanax was the grandson of Priam.
[5] *cf.* VI. xxxv. 1.

Image 3

te primum pia tura rogent, te vota salutent,
purpura te felix, te colat omnis honos:
tu tamen hoc mavis, Latiae quod contigit urbi
mense tuo reducem, Iane, videre deum.

IX

Solvere dodrantem nuper tibi, Quinte, volebat
lippus Hylas, luscus vult dare dimidium.
accipe quam primum; brevis est occasio lucri:
si fuerit caecus, nil tibi solvet Hylas.

X

Emit lacernas milibus decem Bassus
Tyrias coloris optimi. lucrifecit.
"Adeo bene emit?" inquis. immo non solvet,

XI

Pervenisse tuam iam te scit Rhenus in urbem;
nam populi voces audit et ille tui:
Sarmaticas etiam gentes Histrumque Getasque
laetitiae clamor terruit ipse novae.
dum te longa sacro venerantur gaudia Circo,
nemo quater missos currere sensit equos.
nullum Roma ducem, nec te sic, Caesar, amavit:
te quoque iam non plus, ut velit ipsa, potest.

long ages, albeit pious incense invokes thee, prayers salute thee first, to thee the consul's joyous purple, to thee every magistrate pays court, yet this thou countest more—it has been thy fortune, Janus, in thine own month to see our god[1] returning home!

IX

Hylas, when blear-eyed, Quintus, was willing lately to pay you three-quarters of his debt; now he is one-eyed he is willing to give half. Take it at once: brief is the opportunity for gain; if he become blind, Hylas won't pay you a penny.

X

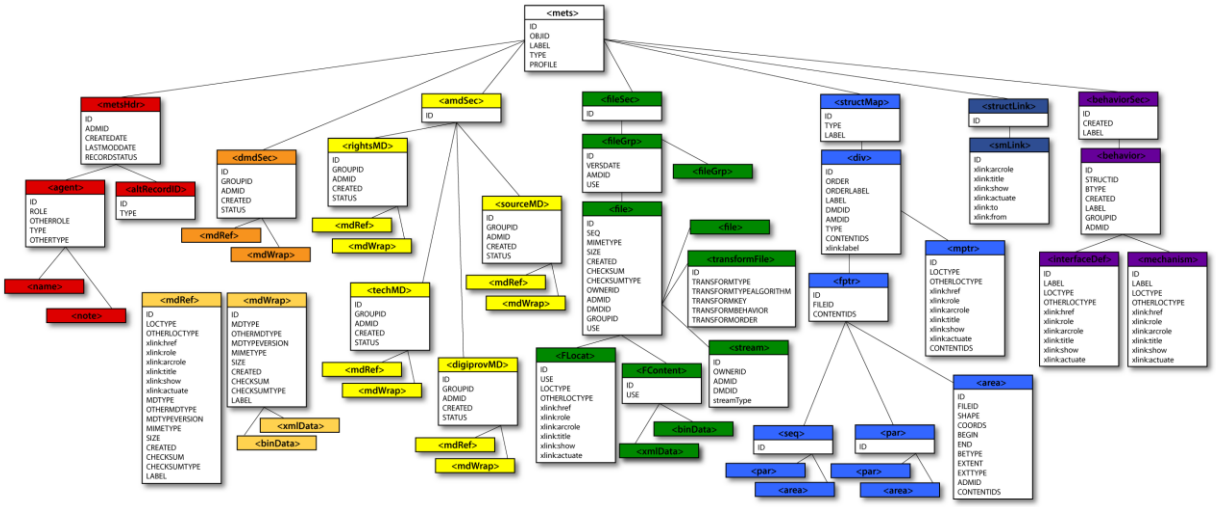
Bassus has bought a cloak for ten thousand sesterces, a Tyrian of the best colour. He has made a bargain. "Did he buy so cheap?" you ask. Aye, he is not going to pay.

XI

That thou hast come to thy city Rhine knows already, for he too hears the voices of thy people: Sarmatian tribes as well, and Hister and the Getae, the very shout of our new-found gladness has affeared. While in the sacred Circus applause long sustained revered thee, no man perceived the steeds had four times been started. No chief has Rome so loved, nor thee so much, Caesar, as now; thee too, albeit she would, she cannot now love more.

[1] The Emperor.

Image 4



CHAPTER 1: INTRODUCTION AND BACKGROUND

WHAT IS METS?

The Metadata Encoding and Transmission Standard (METS) is a data encoding and transmission specification, expressed in XML, that provides the means to convey the metadata necessary for both the management of digital objects within a repository[1] and the exchange of such objects between repositories (or between repositories and their users). This common object format was designed to allow the sharing of efforts to develop information management tools/services and to facilitate the interoperable exchange of digital materials among institutions (including vendors). The METS XML schema was created in 2001 under the sponsorship of the Digital Library Federation (DLF), is supported by the Library of Congress as its maintenance agency, and is governed by the METS Editorial Board. In 2004 it received NISO Registration, which was renewed in 2006.

WHAT PROBLEM IS METS TRYING TO SOLVE?

Many institutions in the digital arena are finding it at least desirable, if not necessary, to maintain metadata about the digital objects they are creating and/or keeping for the long term. As the number and complexity of these digital objects increases, institutions are finding the metadata needed for successful management, access, and use is both more extensive and different from that used to manage, access, and use its other collections. Many institutions are finding it necessary, for instance, to retain structural metadata that describes, anchors, and organizes the components of a digital object so that the integrity of the digital object may be retained even when its components are stored in different places. And, when a repository of digital objects intends to share metadata about a digital object, or the object itself, with another repository or with a tool meant to render the object, the use of a common data transfer syntax between repositories and between tools greatly improves the facility and efficiency with which the transactions can occur. METS was created and designed to provide a relatively easy format for these kinds of activities during the life-cycle of the digital object.

---

1 The use of the term "repository" in the METS context usually refers to institutions collecting "library-like" digital materials, but can also include digital libraries of course-related content, data-sets, and other scientific materials as well as the digital resources of archives and museums.

HOW IS METS MAINTAINED?

The METS Editorial Board maintains editorial control of METS; it's XML Schema, the METS Profile XML Schema, and official METS documentation. Additionally, the Board promotes the use of the standard, maintains a registry of METS Profiles, and endorses best practices in the use of METS as they emerge. The Board has recently expanded its scope to include support and development of the METS community.

The METS Editorial Board is a volunteer group selected from the international METS community. Board members usually represent institutions which have or plan to implement METS, but also come from different sectors of the information creation and delivery communities including academic research libraries, local and national archives, museums, national libraries, governmental and non-governmental organizations, and vendors. Current membership of the Board can be found on the METS website.

METS is sponsored by the Digital Library Federation, a consortium of libraries and related agencies whose members initiated the effort. The Library of Congress serves as the maintenance agency for METS by hosting the website and providing other invaluable support and services.

WHAT IS METS BUILT UPON?

METS builds upon the work of the Making of America II project (MOA2) which provided an XML document format for encoding the metadata necessary for both the management of digital objects within a repository and the exchange of such objects between repositories (or between repositories and their users). The MOA2 initiative started in 1997. Participants included the University of California, Berkeley (Lead), Stanford University, Penn State, Cornell and New York Public Library. The goal of MOA2 was to define a framework for digital library services; as part of that effort, participants recognized that a common definition of a digital object for library resources would both simplify and reduce the cost of developing a service framework. This effort resulted in the MOA2 DTD (an XML DTD) which defined a digital object standard for encoding structural, descriptive and administrative metadata along with primary content. UC Berkeley and the California Digital Library (CDL) adopted MOA2. Others, like the Library of Congress and Harvard University, considered implementation. MOA2 was a common object format that allowed for the sharing of effort to develop tools/services. The common object format ensures interoperability of digital materials as they are exchanged between institutions (including vendors). Project deliverables included a metadata capture database, a Java object browser, and the MOA2 DTD.

After a few years using the MOA2 DTD, the MOA2 community realized a need to expand their ability to share, archive, and display digital objects which required more varied descriptive and administrative metadata, and the need to support many other data formats including audio / video. In February 2001, the concerned parties first met to review and revise MOA2; the outcome was version 1.0 of the METS XML schema (mets.xsd).[2]

WHO IS THE METS COMMUNITY?

Use of METS has steadily increased since 2001. To the best of our knowledge, many in the METS community are University Libraries, Archives, or Museums, but there is no way to know of all the METS

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2 Those institutions taking part in these discussions were: New York University (host), Columbia University, Cornell University, Harvard University, Library of Congress, METAe project of the European Commission's 5th Framework program, CCS docWorks, Michigan State University, National Archives and Records Administration, New York Public Library, San Diego Supercomputer Center, University of California Berkeley, University of California Los Angeles, University of Chicago, University of Virginia.

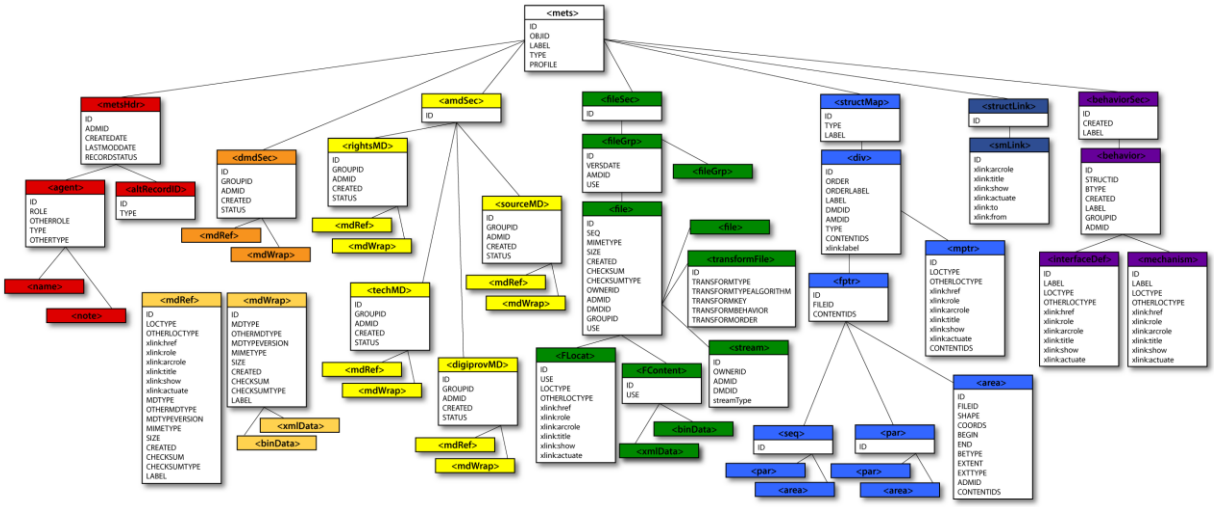
implementations. Those institutions which have chosen to register their implementation can be found on the METS Implementation Registry.

HOW CAN I FIND OUT MORE ABOUT METS?

The METS website maintained by the Library of Congress is a good place to start for those interested in learning more about METS. The current and earlier versions of the METS schema and related documentation, including a METS Overview and Tutorial in a number of languages, can be found on the METS website. In addition, a number of example METS documents can be found as well as recent presentations that describe METS and its implementations. The website also contains a place from which METS-related tools and utilities can be downloaded. Announcements about events, changes to documentation and the schemas themselves are made on the website.

Technical questions about the use of METS and other questions can be addressed to the METS listserv. The METS community has also requested a METS wiki to provide a place where more informal discussions and development of sample METS documents, profiles, and tools can be drafted. The METS wiki is also the place where proposals for changes to either the METS schema or the METS profile schema can be made.

Throughout the year, there are various opportunities for face-to-face meetings with other METS community members. Open Editorial Board meetings are held at each Digital Library Federation Forum in Spring and Fall in various places in the United States. The Board has announced its intention to hold every fourth Board meeting in Europe, usually in conjunction with other digital repository or digital library events. Often DLF and other institutions sponsor and/or host training events such as the METS Opening Days, outlined on the METS website, and METS Implementation Meetings, which often combine both training and discussion on technical issues related to METS implementation, METS profiles, and use of external schemas with METS.



CHAPTER 2: AUTHORING A METS DOCUMENT

The METS standard provides a means of encoding digital library materials. Its most fundamental task in accomplishing this goal is to provide a mechanism for recording the various relationships that exist between pieces of content, and between the content and metadata that compose a digital library object. As the exact meaning and use of the various elements and attributes outlined in Chapter 3 can be difficult to understand in the abstract, this chapter will demonstrate their use in a practical application by creating a METS file for a digital version of Martial's *Epigrams* (see also the full METS Document in Appendix A). These guidelines will be of use for building METS documents by hand as a method to learn the schema, for creating a template to be applied to multiple objects, and for building METS documents programmatically. Due to the extremely complex and detailed nature of METS documents, implementers will not create METS documents for use in a production environment by this method.

The digital version of the *Epigrams* that we will be creating will consist solely of scanned page images from the Harvard University Press edition originally published in 1927. For the purpose of this example, three different image files have been produced for each page: a high-resolution archival master TIFF image, a reference image for web display in JPEG format, and a low resolution GIF thumbnail image. For the digital version, we will want to enable basic "page turner" applications, so that a user can display the individual page images in their reading order. We'll also want to indicate the association between the thumbnail, the reference copy, and the archival master image. We will also want to record descriptive metadata regarding the work, as well as technical metadata regarding the individual page images.

STRUCTURAL MAP AND FILE SECTION

The only required portion of a METS document is the structural map, and most schema-aware editing tools, when asked to create a METS document, will create the outermost <mets> element and a subsidiary <structMap> element. However, when authoring a METS document from scratch, it is often easier to create the file section (<fileSec>) first to record all of the digital content files, and then create both the basic structure for the object within the structural map as well as the links from the structural map to the content files. So in this instance, we will populate the file section of the METS document first.

The <fileSec> portion of the METS document can contain one or more file group (<fileGrp>) elements which can be used to organize the individual file elements into sets. In this case, since we have three different types of files (archival master, reference copy, and thumbnail), we will create three <fileGrp> elements within the <fileSec> to organize the individual files. The basic structure of the file section thus looks like this:

```
<mets:fileSec>
       <mets:fileGrp USE="archive image"></mets:fileGrp>
       <mets:fileGrp USE="reference image"></mets:fileGrp>
       <mets:fileGrp USE="thumbnail image"></mets:fileGrp>
</mets:fileSec>
```

We use the "USE" attribute of the <fileGrp> element to indicate the types of files which can be found within each file group. All that is left at this point is to populate each <fileGrp> with <file> elements for each of the individual content files. METS provides the ability for content either to be stored within the METS file itself or stored externally in another file and referenced. For this example, we will store all of the content externally and reference it using the <FLocat> sub-element of the <file> element as follows:

```
<mets:file ID="epi01m" MIMETYPE="image/tiff">
       <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/
       docgroup/full/01.tif" LOCTYPE="URL"/>
</mets:file>
```

Most of the important information within the <file> element and its sub-elements are actually conveyed via XML attributes. So in this case, the <file> element itself provides two pieces of information: an XML ID value, which bears a unique identifier for this element that allows other portions of this METS document to reference it, and the MIME type for the data file being referenced. The <FLocat> element supplies the location of the content file, using the xlink:href attribute, and also an indication of the type of referencing mechanism being used within the xlink:href attribute, in this case a URL (other possibilities might be a URN, HANDLE or PURL). We can place this <file> element, and similar file elements for the equivalent reference and thumbnail images in the <fileSec> as follows:

```
<mets:fileSec>
       <mets:fileGrp USE="archive image">
              <mets:file ID="epi01m" MIMETYPE="image/tiff">
                     <mets:FLocat
xlink:href="http://www.loc.gov/standards/mets/docgroup/
                      full/01.tif" LOCTYPE="URL"/>
              </mets:file>
       </mets:fileGrp>
       <mets:fileGrp USE="reference image">
              <mets:file ID="epi01r" MIMETYPE="image/jpeg">
                     <mets:FLocat
                      xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/01.jpg"
                      LOCTYPE="URL"/>
              </mets:file>
       </mets:fileGrp>
       <mets:fileGrp USE="thumbnail image">
              <mets:file ID="epi01t" MIMETYPE="image/gif">
                     <mets:FLocat
                      xlink:href="http://www.loc.gov/standards/mets/docgroup/gif/01.gif"
                      LOCTYPE="URL"/>
              </mets:file>
       </mets:fileGrp>
</mets:fileSec>
```

We could continue adding the <file> elements to each of the <fileGrp> elements for each data file for all of the scanned pages, until we have <fileSec> that records the location for every page image file and provides a unique XML ID attribute value for each.

Once the <fileSec> is completed, it is then relatively simple to construct a physical structural map for the work, listing all pages in sequence, and associate the components of the structural map with the various data files contained in the <fileSec> by referencing their XML ID values. A simple structural map for the *Epigrams* might look like the following:

```
<mets:structMap TYPE="physical">
	<mets:div TYPE="book" LABEL="Martial Epigrams II">
		<mets:div TYPE="page" LABEL="Blank page">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page i: Half title page">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page ii: Blank page">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page iii: Title page">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page iv: Publication info">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page v: Table of contents">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page vi: Blank page">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page 1: Half title page">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page 2 (Latin)">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page 3 (English)">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page 4 (Latin)">
		</mets:div>
		<mets:div TYPE="page" LABEL="Page 5 (English)">
		</mets:div>
	</mets:div>
</mets:structMap>
```

In this structural map, we indicate (using the <structMap> TYPE attribute) that we will be providing a physical structure of the work in question (as opposed, for instance, to a logical one), and in this case, that structure consists of saying that the work in question is a book (asserted using the TYPE attribute of the root element in the structMap), and that the book is composed of a subsidiary set of pages. We use the LABEL attribute on each of the elements to state what part of the work this particular element represents. To link the various parts of this structure to the data files in the <fileSec>, we use the <fptr> element. Each 'page' can contain one or more <fptr> elements linking to the different individual images representing that particular page. So, for the very first page in the book (with the label of "blank page"), we could modify the element to include three <fptr> elements as follows:

```
<mets:div TYPE="page" LABEL=" Blank page">
	<mets:fptr FILEID="epi01m"/>
	<mets:fptr FILEID="epi01r"/>
	<mets:fptr FILEID="epi01t"/>
</mets:div>
```

Each <fptr> element has a single FILEID attribute, which provides the value of the ID attribute of the appropriate <file> element within the <fileSec>. So, in this case we have linked the element for the first page of the book to three different files, the master TIFF image version, the reference copy, and the thumbnail version. By inserting <fptr> elements in the other elements within the <structMap>, we can link each to the matching image files for that particular page.

It is worth noting at this point that there are a variety of ways that we could have organized the structural map other than the one used here. We could have chosen to do a logical structural map instead of a physical one, and had elements for the individual books and epigrams, instead of for pages. Given that epigrams may only consume a portion of a page, or run across multiple pages, this would have called for a more complicated mapping to the image files using the <area> sub-element of <fptr> to map a element for a particular epigram to a portion of an image file, and/or the use of the <seq> element to indicate multiple <area> elements pointing to different page image files that must be viewed in sequence to see the entirety of an epigram. We might also have chosen to have two structural maps, one for the Latin version of the work, and one for the English translation, with the "page" level elements mapped to the appropriate page image files in each case. None of these mappings is in any

sense better or more correct; which one you might choose to implement depends upon the needs of your users and the resources you have available to create the necessary structures in METS.

DESCRIPTIVE METADATA SECTION

With a complete <fileSec> and <structMap>, we have sufficient information in our METS document to enable a page-turning application to display the digital library object. But metadata needed for both discovery and management of the work is not yet included. The descriptive metadata needed for discovery is easily added by creating a <dmdSec> element to contain it. We can then insert the descriptive metadata record of our choice (in the example below, a MODS record) within that section.

```
<mets:mets>
       <mets:dmdSec ID="DMD1">
              <mets:mdWrap MIMETYPE="text/xml" MDTYPE="MODS">
                     <mets:xmlData>
                            <mods:mods version="3.1">
                              <mods:titleInfo>
                                   <mods:title>Epigrams</mods:title>
                              </mods:titleInfo>
                               <mods:name type="personal">
                               <mods:namePart>Martial</mods:namePart>
                                   </mods:name>
                               <mods:name type="personal">
                                 <mods:namePart>Ker, Walter C. A. (Walter Charles
Alan),1853-1929
                                 </mods:namePart>
                               </mods:name>
                               <mods:typeOfResource>text</mods:typeOfResource>
                            </mods:mods>
                     </mets:xmlData>
              </mets:mdWrap>
       </mets:dmdSec>
       <mets:fileSec>
       </mets:fileSec>
       <mets:structMap>
       </mets:structMap>
</mets:mets>
```

There are several things to note about this example. The first is that we have chosen to embed the MODS record itself within the METS document; as an alternative, we could have stored the MODS record in a separate file, and then used the <mdRef> element instead of the <mdWrap> element within <dmdSec> to reference the location of the MODS record.

```
<mets:mets>
       <mets:dmdSec ID="DMD1">
              <mets:mdRef MIMETYPE="application/MODS" MDTYPE="MODS"/>
                     <mets:binData>[base 64 encoded data goes
here]</mets:binData>
       </mets:dmdSec>
</mets:mets>
```

The second is that the <mdWrap> element contains another subsidiary element, the <xmlData> element. Since we are including a MODS record, this is the appropriate choice, but we could just as easily have placed a MARC record within the <dmdSec>, in which case we should have used the binary data wrapper element <binData> instead of <xmlData>. Finally, note that we have assigned a unique XML ID attribute value to the <dmdSec> element itself. This allows other portions of the METS document to reference to this descriptive metadata record. For example, if we wish to link the root element within the structural map to this MODS record to indicate that it pertains to the whole book (and not an individual page within the book), we could alter the element to include a DMDID attribute referencing the MODS records ID attribute value as follows:

```
<mets:div TYPE="book" LABEL="Martial Epigrams II" DMDID="DMD1">
```

In this case, linking to the descriptive metadata record might not be crucial, but in cases where you may have separate descriptive metadata records for a book and individual chapters within the book (say for an edited volume compiling works from different authors) the ability to link a particular portion of the structure of the work to its own descriptive metadata record is valuable.

ADMINISTRATIVE METADATA SECTION

In addition to descriptive metadata, management of digital objects can require substantial amounts of administrative metadata. For a newly created object such as this, there are at least two forms of administrative metadata that might be added immediately. The first is some form of intellectual property rights statement regarding the content of the digital object and the source from which it was derived. The second is technical metadata regarding the content files themselves. METS provides a section for recording all of these forms of administrative metadata, the <amdSec> element. Within the <amdSec> element, there are four major sub-elements: <techMD>, <rightsMD>, <sourceMD>, and <digiprovMD>. The <techMD> element records technical metadata about content files, <rightsMD> records intellectual property rights information, <sourceMD> records descriptive, technical or rights information about an analog source document used to generate the digital library object, and <digiprovMD> records digital preservation information, such as information about the digital library object's life-cycle and history.

Our digital object, in this case, was digitized from a public domain edition of Martial's *Epigrams*, so a relatively short statement to that effect created using the METSRights schema will suffice for this object:

```
<mets:amdSec>
   <mets:rightsMD ID="ADMRTS1">
       <mets:mdWrap MDTYPE="OTHER" OTHERMDTYPE="METSRights">
           <mets:xmlData>
               <rts:RightsDeclarationMD RIGHTSCATEGORY="PUBLIC DOMAIN">
                   <rts:Context CONTEXTCLASS="GENERAL PUBLIC">
                       <rts:Constraints CONSTRAINTTYPE="RE-USE">
                           <rts:ConstraintDescription>This volume was published in Great
                           Britain in 1927 by William Heineman (London) with a reference
                           to G.P. Putnam's Sons in New York. (The verso of the title page
                           says "Printed in Great Britain" and notes that it was
                           originally published in 1920 and reprinted in 1927). Because
                           this work was published abroad before 1978 without compliance
                           with US Copyright formalities and because it entered the public
                           domain in its home country as of 1 January 1996, it is now also
                           considered in the public domain in the United States without
                           any constraints on use.
                           </rts:ConstraintDescription>
                       </rts:Constraints>
                   </rts:Context>
               </rts:RightsDeclarationMD>
           </mets:xmlData>
       </mets:mdWrap>
   </mets:rightsMD>
</mets:amdSec>
```

As with the descriptive metadata record, it is useful to clarify that this record applies to the entirety of the work by associating it with the root element in the structural map. Editing the element to add an ADMID attribute linking the to this rights statement via the ID attribute on the <rightsMD> element accomplishes this:

```
<mets:div TYPE="book" LABEL="Martial Epigrams II" DMDID="DMD1" ADMID="ADMRTS1">
```

TECHNICAL METADATA

In addition to intellectual property rights information, long-term management and preservation of digital resources requires information regarding the technical characteristics of the digital content. Such technical metadata about text, image, audio, and video data is best produced when the digital content is

originally created. The following record, encoded using the MIX format conforming to the NISO Z39.87 specification, provides technical metadata for the first master TIFF image in our book:

```
<mets:techMD ID="TECHTIFF01">
<mets:mdWrap MDTYPE="NISOIMG">
<mets:xmlData>
<mix:mix>
   <mix:BasicImageParameters>
       <mix:Format>
           <mix:MIMEType>image/tiff</mix:MIMEType>
           <mix:ByteOrder>little-endian</mix:ByteOrder>
           <mix:Compression>
               <mix:CompressionScheme>1</mix:CompressionScheme>
           </mix:Compression>
           <mix:PhotometricInterpretation>
               <mix:ColorSpace>1</mix:ColorSpace>
           </mix:PhotometricInterpretation>
           <mix:Segments>
               <mix:StripOffsets>17810</mix:StripOffsets>
               <mix:RowsPerStrip>3948</mix:RowsPerStrip>
               <mix:StripByteCounts>10256904</mix:StripByteCounts>
           </mix:Segments>
           <mix:PlanarConfiguration>1</mix:PlanarConfiguration>
       </mix:Format>
       <mix:File>
           <mix:Orientation>1</mix:Orientation>
       </mix:File>
   </mix:BasicImageParameters>
   <mix:ImageCreation>
       <mix:ScanningSystemCapture>
           <mix:ScanningSystemSoftware>
               <mix:ScanningSoftware>Adobe Photoshop CS Macintosh</mix:ScanningSoftware>
           </mix:ScanningSystemSoftware>
       </mix:ScanningSystemCapture>
       <mix:DateTimeCreated>2006-03-13T12:05:05</mix:DateTimeCreated>
   </mix:ImageCreation>
   <mix:ImagingPerformanceAssessment>
       <mix:SpatialMetrics>
           <mix:SamplingFrequencyUnit>2</mix:SamplingFrequencyUnit>
           <mix:XSamplingFrequency>600</mix:XSamplingFrequency>
           <mix:YSamplingFrequency>600</mix:YSamplingFrequency>
           <mix:ImageWidth>2598</mix:ImageWidth>
           <mix:ImageLength>3948</mix:ImageLength>
       </mix:SpatialMetrics>
       <mix:Energetics>
           <mix:BitsPerSample>8</mix:BitsPerSample>
           <mix:SamplesPerPixel>1</mix:SamplesPerPixel>
       </mix:Energetics>
   </mix:ImagingPerformanceAssessment>
</mix:mix>
</mets:xmlData>
</mets:mdWrap>
</mets:techMD>
```

As with our other examples, this metadata record is in XML format, and so it is wrapped within <mdWrap> and <xmlData> tags. Note that this record is wrapped in a <techMD> element (which would itself be inserted in the <amdSec> portion of a METS document), and that the <techMD> tag has an ID attribute with a value of "TECHTIFF01" allowing us to reference this record from elsewhere in the METS document.

Unlike our previous examples, however, where we wished to associate the metadata records in question with the entirety of the digital object, in this case we want to associate this technical metadata record with a specific image file. So in this case, we alter the <file> tag for the appropriate image file within the <fileSec> to include an ADMID attribute linking the image file to the appropriate technical metadata as follows:

```
<mets:fileSec>
   <mets:fileGrp USE="archive image">
       <mets:file ID="epi01m" MIMETYPE="image/tiff" ADMID="TECHTIFF01">
           <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/
            full/01.tif" LOCTYPE="URL"/>
       </mets:file>
       . . .
   </mets:fileGrp>
</mets:fileSec>
```

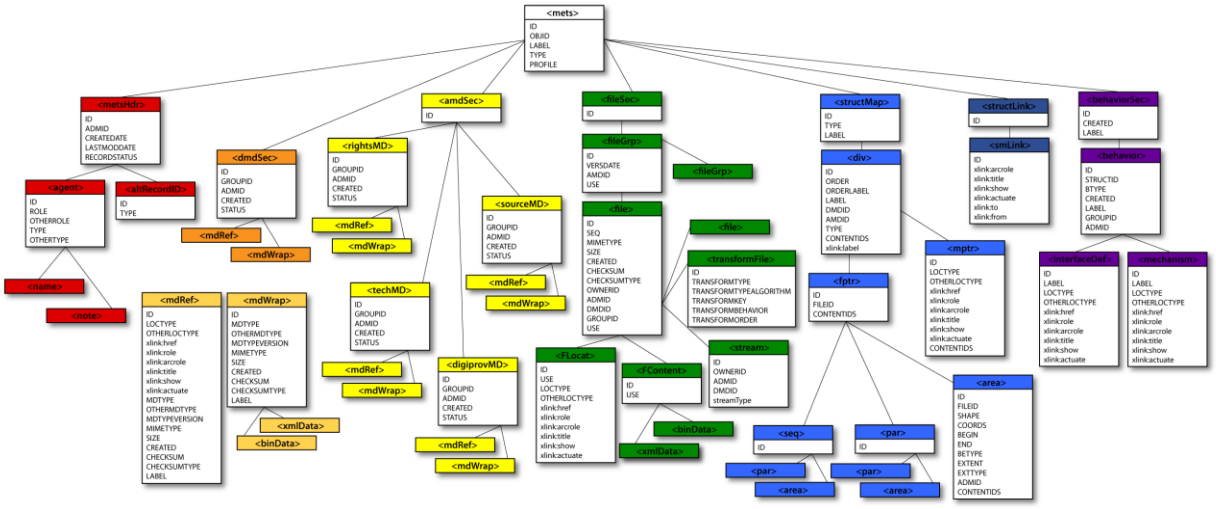
CONCLUSION

In the complete example included in Appendix A, you will find that there is a complete MIX record for each of the image files. One possible downside to the approach taken in this example is that quite a bit of room is consumed in the METS document recording replicated information. All of the master images have the same MIME type, byte order, color space, etc. A more efficient means of encoding this information would be to take the technical metadata that is shared by all of the images and placing it in a single MIX record which could be linked via the <file> elements' ADMID attributes to all of the appropriate image files. Information specific to particular image files, such as strip offsets, creation date and time and image width and length, can be placed in separate MIX records. Then individual <file> elements can use the ADMID attribute to link to both the MIX record containing the shared technical metadata and the MIX record containing the technical metadata specific to that particular image file.

As a final addition to the basic METS document, we might wish to include some minimal metadata about the creation of the METS document itself, such as its creation date and author. This type of information is stored within the METS Header element (<metsHdr>), which is the first major section of a METS document after the opening <mets> element itself:

```
<mets:mets>
       <mets:metsHdr CREATEDATE="2006-05-09T10:30:00">
              <mets:agent ROLE="CREATOR">
                     <mets:name>Rick Beaubien</mets:name>
              </mets:agent>
       </mets:metsHdr>
       ...
</mets:mets>
```

By combining the <metsHdr>, <dmdSec>, <amdSec>, <fileSec> and <structMap> sections in a single METS document, we can create a document that contains the structure needed for applications to display the image data for this work in a reasonably sophisticated fashion as well as providing the information needed for both retrieval and management purposes. More robust applications are possible as well, as METS provides other more sophisticated capabilities for structural information. <area> elements can be used within the structural map to link a element with only a portion of a content file; <seq> and <par> elements may be used to link elements with more than one content file simultaneously (useful, for example, to link a with separate audio and video streams representing the content at that). There is also the behavior metadata section (<behaviorSec>) which allows the METS document to record information about software behaviors that may be useful for accessing all, or part, of the METS object. But the five sections discussed in this chapter are often all that is needed to represent even fairly complex works



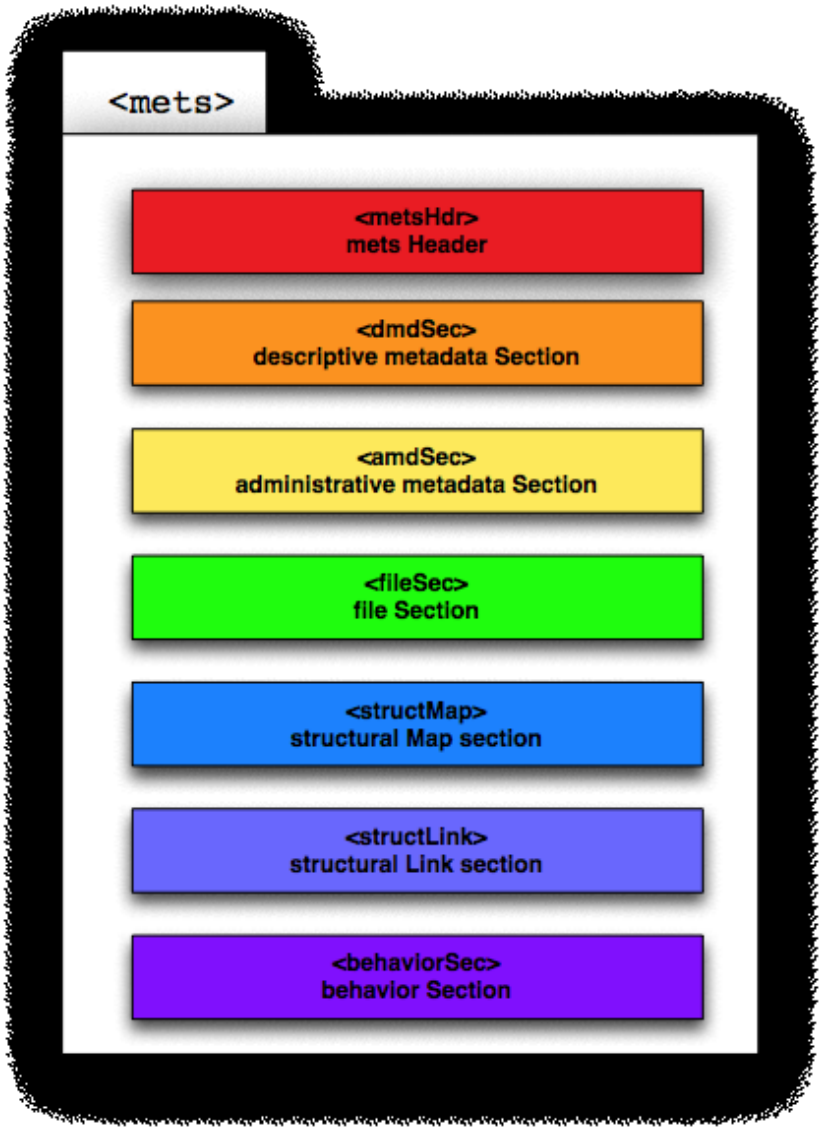
(click on diagram for enlarged view)

CHAPTER 3: FROM THE SCHEMA PERSPECTIVE

This chapter will discuss and expand on upon the schema and as such will present sections, elements and attributes in the same order as they appear in the schema. For a quick reference to the various elements and attributes discussed here as well as complexTypes used in METS, there are tables in Appendix B. In this text each attribute is underlined, followed in parentheses with the XML dataType and an */O* to indicate that the attribute is Optional or a */R* for one that is Required. Early reviews requested that elements be expressed in their <element> form in this chapter. The first time reader will encounter instances where an <element> name is not fully spelled out prior to use, for example when an element encountered earlier in the schema is referenced. This chapter was envisioned primarily as a reference tool for implementers who wish to dip in and out of specific sections as needed.

As discussed in Chapter 2 many of the examples will be drawn from Martial's *Epigrams*, for consistency and for the ease of using a text to illustrate these concepts. Although text is not the only genre or content type that may be encoded using METS, most of the examples are drawn from images of pages of text. METS has also been used to encode audio, video, audio/video, TEI, and other formats. In cases where other content type structures can concisely illustrate usage they will be used as well.

This documentation uses the term "METS document" to refer to the serialized XML document conforming to the METS schema. By contrast, the term "METS object" refers to the entire digital artifact represented by the METS document, including any externally referenced content or metadata needed to constitute a complete object. How an implementer chooses to use the identifiers associated with the mets root element may vary depending upon the situation.



<METS> METS ROOT ELEMENT

The root element <mets> establishes the container for the information being stored and/or transmitted by the standard.

ATTRIBUTES OF THE METS ROOT ELEMENT

ID (*ID/O*): This attribute uniquely identifies the root element of the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

OBJID (*string/O*): Is the primary identifier assigned to the METS object as a whole. Although this attribute is not required, it is strongly recommended. This identifier is used to tag the entire METS object to external systems, in contrast with the ID identifier.

LABEL (*string/O*): Is a simple a title string used to identify the object/entity being described in the METS document for the user.

TYPE (*string/O*): Specifies the class or type of the object, e.g.: book, journal, stereograph, dataset, video, etc.

PROFILE (*string/O*): Indicates to which of the registered profile(s) the METS document conforms. For additional information about PROFILES see Chapter 5.

```
<mets:mets OBJID="loc.natlib.ihas.200003790"
PROFILE="http://www.loc.gov/mets/profiles/00000007.xml"
xsi:schemaLocation="http://www.loc.gov/METS_Profile/
http://www.loc.gov/standards/mets/profile_docs/mets.profile.v1-2.xsd
http://www.loc.gov/METS/ http://www.loc.gov/standards/mets/mets.xsd
http://www.loc.gov/mods/v3 http://www.loc.gov/standards/mods/v3/mods-3-0.xsd">
```

ELEMENTS CONTAINED IN THE ROOT ELEMENT

The METS document structure consists of seven major sections, which in turn may contain a variety of elements and attributes as specified in the METS schema.

At the most general level a METS document may contain the following sections: each of which is described in its own section of this chapter.

METS Header – The METS Header contains metadata describing the METS document itself, including such information as creator, editor, etc.

Descriptive Metadata Section – This section contains descriptive metadata that is external to the METS document (e.g., a MARC record in an OPAC or a MODS record maintained on a WWW server), internally embedded descriptive metadata, or both. Multiple instances of both external and internal descriptive metadata may be included in the descriptive metadata section.

Administrative Metadata Section – Information about how the files were created and stored, intellectual property rights, metadata regarding the original source object from which the digital object was derived, information regarding the provenance of the files that comprise the object (i.e., master/derivative file relationships, and migration/transformation information) is collected this section. As with descriptive metadata, the administrative metadata can be either external to the METS document, or encoded internally.

File Section – A list of all files that contain content which make up the electronic versions of the digital object. File elements may be grouped within File Group elements, to provide for subdividing the files by object version or other criteria such as file type, size etc.

Structural Map – This is the heart of the METS document. It outlines a hierarchical structure for the digital object, and links the elements of that structure to content files and metadata that pertain to each element. The structural map is the one mandatory section in a METS document.

Structural Links – Allows the creator of the METS document to record the existence of hyperlinks between nodes in the hierarchy outlined in the Structural Map. This is of particular value in using METS to archive Websites or other hypermedia.

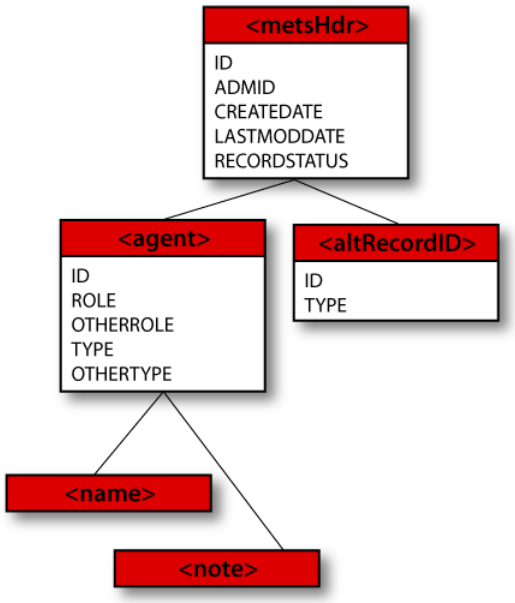
Behavior Section – A behavior section can be used to associate executable behaviors with the content of the object encoded using METS. Each behavior within a behavior section has an interface definition element that represents an abstract definition of behaviors represented by a particular behavior section. Each behavior also has a mechanism element that identifies a module of executable code that implements and runs the behaviors defined by the interface definition.

METS ROOT ELEMENT EXAMPLE

This example uses: XML version 1.0 with UTF-8 encoding, an enumerated list of the standards used in this record with the URLs, the OBJID for this digital object represented by the METS document in the

form of a URN, and a human readable LABEL which describes the work being encoded (in this case, the title of the work).

```
<?xml version=”1.0” encoding=”UTF-8”?>
<mets:mets xmlns:mets=”http://www.loc.gov/METS/”
 xmlns:mods=”http://www/loc.gov.mods/v3” xmlns:xlink=”http://www.w3.org/1999/xlink”
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.loc.gov/METS/ http://www.loc.gov/standards/mets/mets.xsd
http://www.loc.gov/mods/v3 http://www.loc.gov.mods/v3/mods-3-1.xsd”
OBJID=”ark:/13030/kt9s2009hz” LABEL=”Martial Epigrams”>
```



<METSHDR> METS HEADER

The **mets header** element <metsHdr> captures metadata about the METS document itself, not the digital object the METS document encodes. Although it records a more limited set of metadata, it is very similar in function and purpose to the headers employed in other schema such as the Text Encoding Initiative (TEI) or in the Encoded Archival Description (EAD).

ATTRIBUTES OF THE METS HEADER

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

ADMID (IDREFS/O): Contains the ID attribute values of the <techMD>, <sourceMD>, <rightsMD> and/or <digiprovMD> elements within the <amdSec> of the METS document that contain administrative metadata pertaining to the METS document itself. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4 of the METS Primer.

CREATEDATE (*dateTime/O*): Records the date/time the METS document was created.

LASTMODDATE (*dateTime/O*): Is used to indicate the date/time the METS document was last modified.

RECORDSTATUS (*string/O*): Specifies the status of the METS document. It is used for internal processing purposes.

ELEMENTS CONTAINED IN THE METS HEADER

The <metsHdr> may include: document author or agent, any alternative identifiers for a METS document, creation and update dates and times, and the status of the METS document.

AGENT

The **agent** element <agent> provides for various parties and their roles with respect to the METS record to be documented.

AGENT – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

ROLE (string/R): Specifies the function of the agent with respect to the METS record. The allowed values are:

CREATOR: The person(s) or institution(s) responsible for the METS document.

EDITOR: The person(s) or institution(s) that prepares the metadata for encoding.

ARCHIVIST: The person(s) or institution(s) responsible for the document/collection.

PRESERVATION: The person(s) or institution(s) responsible for preservation functions.

DISSEMINATOR: The person(s) or institution(s) responsible for dissemination functions.

CUSTODIAN: The person(s) or institution(s) charged with the oversight of a document/collection.

IPOWNER: Intellectual Property Owner: The person(s) or institution holding copyright, trade or service marks or other intellectual property rights for the object.

OTHER: Use OTHER if none of the preceding values pertains and clarify the type and location specifier being used in the OTHERROLE attribute (see below).

OTHERROLE (*string/O*): Denotes a role not contained in the allowed values set if OTHER is indicated in the ROLE attribute.

TYPE (*string/O*): is used to specify the type of AGENT. It must be one of the following values:

INDIVIDUAL: Use if an individual has served as the agent.

ORGANIZATION: Use if an institution, corporate body, association, non-profit enterprise, government, religious body, etc. has served as the agent.

OTHER: Use OTHER if none of the preceding values pertain and clarify the type of agent specifier being used in the OTHERTYPE attribute (see below)."

OTHERTYPE (*string/O*): Specifies the type of agent when the value OTHER is indicated in the TYPE attribute.

AGENT – ELEMENTS

The element <agent> has two sub-elements, **name** <name> and **note** <note>. The element <name> can be used to record the full name of the document agent. The <note> element can be used to record any additional information regarding the agent's activities with respect to the METS document.

AGENT – EXAMPLE

This example shows a METS document that was created on 9th of May 2006 at 10:30 a.m., by Rick Beaubien.

```
<metsHdr CREATEDATE="2006-05-09T10:30:00">
       <mets:agent ROLE="CREATOR">
              <mets:name>Rick Beaubien</mets:name>
       </mets:agent>
</metsHdr>
```

ALTERNATIVE IDENTIFIERS

The **alternative identifier** element <altRecordID> allows one to use alternative record identifier values for the digital object represented by the METS document; the primary record identifier is stored in the OBJID attribute in the root <mets> element.

ALTERNATIVE IDENTIFIERS – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

TYPE (*string/O*): A description of the identifier type (e.g., OCLC record number, LCCN, etc.)

ALTERNATIVE IDENTIFIERS – EXAMPLES

First example: expanding on the basic example, altRecordID reflects the Library of Congress Control Number (LCCN) associated with the manifestation "20023838".

```
<metsHdr CREATEDATE="2006-05-09T00:00:00>
       <mets:agent ROLE="CREATOR">
              <mets:name>Rick Beaubien</mets:name>
       </mets:agent>
       <mets:altRecordID TYPE="LCCN">20022838</mets:altRecordID>
<mets:metsHdr>
```

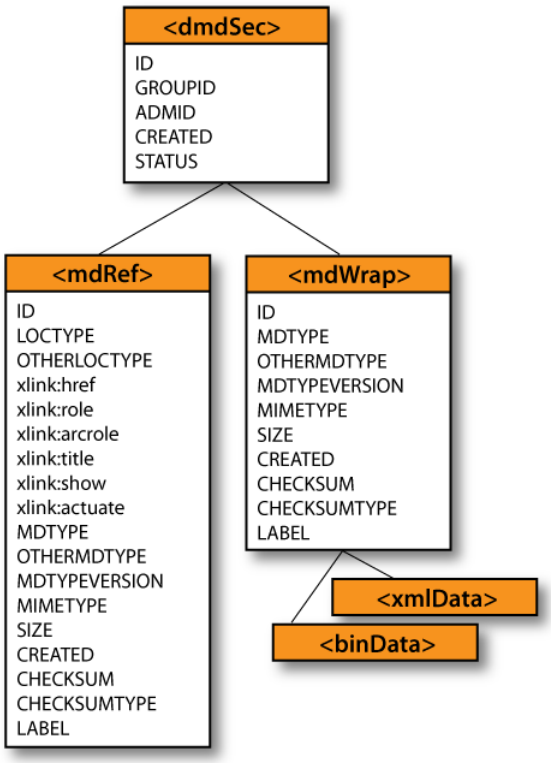
In the second example, altRecordID reflects the University of California, San Diego's internal identification code for the object; this example also reflects various uses of the role attribute on agent.

```
<metsHdr CREATEDATE="2004-02-22T00:00:00"> LASTMODDATE="2004-03-16T00:00:00"
RECORDSTATUS="production">
   <mets:agent ROLE="CREATOR" TYPE="ORGANIZATION">
       <mets:name>UCSD</mets:name>
       <mets:note>SIP METS submitted to CDL.</mets:note>
   </mets:agent>
   <mets:agent ROLE="PRESERVATION" TYPE="ORGANIZATION">
       <mets:name>California Digital Library</mats:name>
       <mets:note>SIP METS and associated file(s) placed in Preservation Repository.
       </mets:note>
   </mets:agent>
   <mets:agent ROLE="EDITOR" TYPE="ORGANIZATION">
       <mets:name>California Digital Library</mets:name>
   <mets:note>DIP METS created.</mets:note>
   </mets:agent>
   <mets:agent ROLE="DISSEMINATOR" TYPE="ORGANIZATION">
       <mets:name>California Digital Library</mets:name>
       <mets:note>Object placed in production.</mets:note>
   </mets:agent>
   <mets:altRecordID TYPE="UCSD">siogc29s5</altRecordID>
</metsHdr>
```

METS HEADER EXAMPLE

Modification to this example record is indicated in LASTMODDATE.

```
<metsHdr CREATEDATE="2006-05-09T15:00:00" LASTMODDATE=”2006-05-09T21:00:00>
   <mets:agent ROLE="CREATOR" TYPE="INDIVIDUAL">
           <mets:name>Rick Beaubien</mets:name>
       </mets:agent>
       <mets:altRecordID TYPE=”LCCN”>20022838</mets:altRecordID>
</metsHdr>
```



<DMDSEC> DESCRIPTIVE METADATA

The **descriptive metadata section** <dmdSec> records descriptive metadata pertaining to the METS object as a whole or one of its components. Multiple descriptive metadata sections are allowed so that descriptive metadata can be recorded for each separate item or component within the METS document.

Descriptive metadata can be expressed according to many current content standards (i.e., *MARC, MODS, Dublin Core, TEI Header, EAD, VRA, FGDC, DDI*) or a locally produced XML schema.

METS does not itself provide a vocabulary or syntax for encoding this descriptive metadata; *no descriptive metadata elements* are defined in METS. Content guidelines are supplied by the specific descriptive standard used. METS does, however, provide a means for linking this metadata to the digital content of the entity and to other types of metadata related to the object, such as structural and administrative metadata.

ATTRIBUTES OF THE DESCRIPTIVE METADATA SECTION

ID (*ID/R*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. The ID attribute on the <dmdSec> is required, and its value should be referenced from one or more DMDID attributes that are associated with other elements in the METS document. The following elements support references to a <dmdSec> via a DMDID attribute: <file>, <stream>, . For more information on using ID attributes for internal and external linking see Chapter 4.

GROUPID (*string/O*): This identifier is used to indicate that different metadata sections may be considered as part of a group. Two metadata sections with the same GROUPID value are to be

considered part of the same group. For example this facility might be used to group changed versions of the same metadata if previous versions are maintained in a file for tracking purposes.

ADMID (*IDREFS/O*): Contains the ID attribute values of the <digiprovMD>, <techMD>, <sourceMD> and/or <rightsMD> elements within the <amdSec> of the METS document that contain administrative metadata pertaining to the current <dmdSec> element. Typically used in this context to reference preservation metadata (digiprovMD) which applies to the current metadata element. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

CREATED (*dateTime/O*): Specifies the date and time of creation for the metadata.

STATUS (*string/O*): Indicates the status of this metadata (e.g., superseded, current, etc.).

DESCRIPTIVE METADATA ELEMENTS

A descriptive metadata element can either wrap the metadata (mdWrap) or reference it in an external location (mdRef) or both. For example, a MODS record can be encoded in XML and embedded into the descriptive metadata section or a MARC record could be included in binary format. Alternately, the descriptive metadata section may simply identify the type of descriptive metadata it represents (MARC, EAD, etc), and point to this metadata in its external location via a URI. This is done by the metadata Wrap <mdWrap> and metadata Reference <mdRef> elements, which are discussed in more detail below.

METADATA REFERENCE

The **metadata reference** element <mdRef> element is used to provide a pointer to metadata which resides outside the METS document.

NOTE: <mdRef> is an empty element; the location of the external metadata must be recorded in the xlink:href attribute, and can be supplemented by the XPTR attribute as needed.

METADATA REFERENCE – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

MIMETYPE (*string/O*): The IANA MIME media type for the associated file. Some values for this attribute can be found on the IANA website.

LABEL (*string/O*): Provides a label, for display to the viewer of the METS document, which identifies the referenced metadata.

XPTR (*string/O*): Locates the point within a file to which the <mdRef> element refers, if applicable, using any valid XPointer scheme.

LOCTYPE (*string/R*): Specifies the locator type used in the xlink:href attribute. Valid values for LOCTYPE are: *ARK, URN, URL, PURL, HANDLE, DOI*, and *OTHER*.

OTHERLOCTYPE (*string/O*): Specifies the locator type when the value *OTHER* is used in the LOCTYPE attribute. Although optional, it is strongly recommended when OTHER is used.

MDTYPE (*string/R*): Is used to indicate the type of the associated metadata. Valid values for the MDTYPE element include:

MARC: any form of MARC record
MODS: metadata in the Library of Congress MODS format
EAD: Encoded Archival Description finding aid

DC: Dublin Core
NISOIMG: NISO Technical Metadata for Digital Still Images
LC-AV: technical metadata specified in the Library of Congress A/V prototyping project
VRA: Visual Resources Association Core
TEIHDR: Text Encoding Initiative Header
DDI: Data Documentation Initiative
FGDC: Federal Geographic Data Committee metadata
LOM: Learning Object Model
PREMIS: PREservation Metadata: Implementation Strategies
PREMIS:OBJECT: PREMIS Object entiry
PREMIS:AGENT: PREMIS Agent entity
PREMIS:RIGHTS: PREMIS Rights entity
PREMIS:EVENT: PREMIS Event entity
TEXTMD: textMD Technical metadata for text
METSRIGHTS: Rights Declaration Schema
OTHER: metadata in a format not specified above

MDTYPEVERSION(*string/O*): Provides a means for recording the version of the type of metadata (as recorded in the MDTYPE or OTHERMDTYPE attribute) that is being used. This may represent the version of the underlying data dictionary or metadata model rather than a schema version.

OTHERMDTYPE (*string/O*): Specifies the form of metadata in use when the value OTHER is indicated in the MDTYPE attribute.

SIZE (*long/O*): Specifies the size in bytes of the associated file or wrapped content.

CREATED (*dateTime/O*): Specifies the date and time of creation for the associated file or wrapped content.

CHECKSUM (*string/O*): Provides a checksum value for the associated file or wrapped content.

CHECKSUMTYPE (*enumerated string/O*): Specifies the checksum algorithm used to produce the value contained in the CHECKSUM attribute. CHECKSUMTYPE must contain one of the following values: *Adler-32, CRC32, HAVAL, MD5, MNP, SHA-1, SHA-256, SHA-384, SHA-512, TIGER* and *WHIRLPOOL.*

METADATA REFERENCE– EXAMPLE

The following example demonstrates the use of the <mdRef> element.

```
<dmdSec ID="DMD1">
    <mdRef MIMETYPE="text/xml" LABEL="MODS record" LOCTYPE="URN" MDTYPE="MODS"
xlink:href="urn:x-nyu:fales1735"/>
</dmdSec>
```

METADATA WRAPPER

A **metadata wrapper** element <mdWrap> provides a wrapper around metadata embedded within a METS document. The element is repeatable. Such metadata can be in one of two forms:

1. XML-encoded metadata, with the XML-encoding identifying itself as belonging to a namespace other than the METS document namespace.
2. Any arbitrary binary or textual form, PROVIDED that the metadata is Base64 encoded and wrapped in a <binData> element within the internal descriptive metadata element.

INTERNAL DESCRIPTIVE METADATA – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

MIMETYPE (*string/O*): Provides the MIME type for the metadata being wrapped.

LABEL (*string/O*): Provides a label, for display to the viewer of the METS document, that identifies the associated metadata.

MDTYPE (*string/R*): Allows for the recording of the type the metadata being wrapped. Valid values for the MDTYPE element include:

MARC: any form of MARC record
MODS: metadata in the Library of Congress MODS format
EAD: Encoded Archival Description finding aid
DC: Dublin Core
NISOIMG: NISO Technical Metadata for Digital Still Images
LC-AV: technical metadata specified in the Library of Congress A/V prototyping project
VRA: Visual Resources Association Core
TEIHDR: Text Encoding Initiative Header
DDI: Data Documentation Initiative
FGDC: Federal Geographic Data Committee metadata
LOM: Learning Object Model
PREMIS: PREservation Metadata: Implementation Strategies
PREMIS:OBJECT: PREMIS Object entiry
PREMIS:AGENT: PREMIS Agent entity
PREMIS:RIGHTS: PREMIS Rights entity
PREMIS:EVENT: PREMIS Event entity
TEXTMD: textMD Technical metadata for text
METSRIGHTS: Rights Declaration Schema
OTHER: metadata in a format not specified above

MDTYPEVERSION(*string/O*): Provides a means for recording the version of the type of metadata (as recorded in the MDTYPE or OTHERMDTYPE attribute) that is being used. This may represent the version of the underlying data dictionary or metadata model rather than a schema version.

OTHERMDTYPE (*string/O*): Specifies the form of metadata in use when the value *OTHER* is indicated in the MDTYPE attribute.

SIZE (*long/O*): Specifies the size in bytes of the associated file or wrapped content.

CREATED (*dateTime/O*): Specifies the date and time of creation for the associated file or wrapped content.

CHECKSUM (*string/O*): Provides a checksum value for the associated file or wrapped content.

CHECKSUMTYPE (*enumerated string/O*): Specifies the checksum algorithm used to produce the value contained in the CHECKSUM attribute. CHECKSUMTYPE must contain one of the following values: *Adler-32, CRC32, HAVAL, MD5, MNP, SHA-1, SHA-256, SHA-384, SHA-512, TIGER* and *WHIRLPOOL*.

INTERNAL DESCRIPTIVE METADATA – ELEMENTS

The <mdWrap> element has two elements:

- <binData> - a wrapper element to contain Base64 encoded metadata.
- <xmlData> - a wrapper element to contain XML encoded metadata.

The content of an <xmlData> element can be in any namespace or in no namespace. As permitted by the XML Schema Standard, the processContents attribute value for the metadata in an <xmlData> is set to "lax". Therefore, if the source schema and its location are identified by means of an XML schemaLocation attribute, then an XML processor will validate the elements for which it can find declarations. If a source schema is not identified, or cannot be found at the specified schemaLocation, then an XML validator will check for well-formedness, but otherwise skip over the elements appearing in the <xmlData> element.

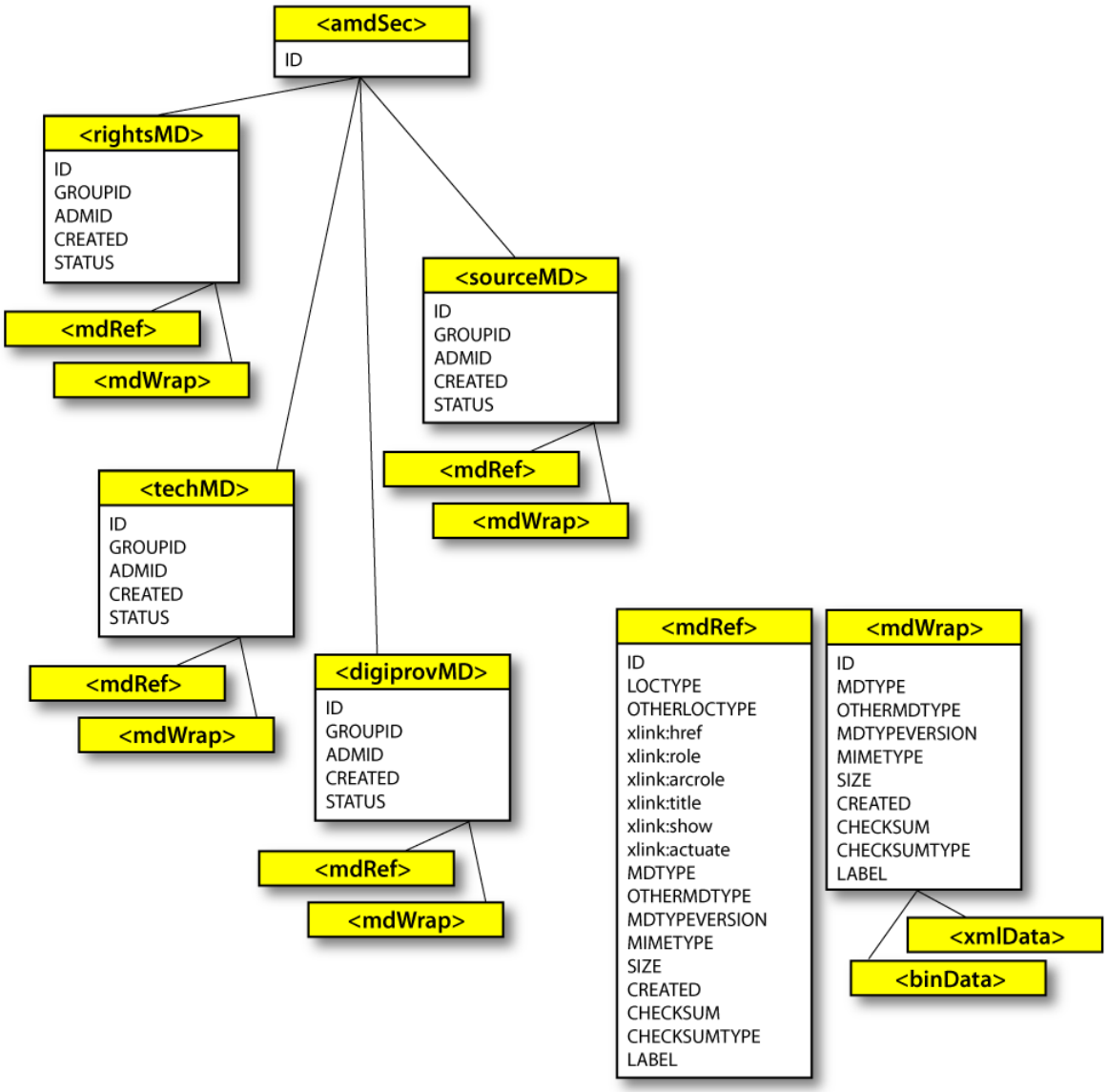
INTERNAL DESCRIPTIVE METADATA – EXAMPLE

The following examples demonstrate the use of the <mdWrap> element:

```
<mets:dmdSec ID="DMD1">
   <mets:mdWrap MDTYPE="MODS">
       <mets:xmlData>
           <mods:mods>
           <mods:titleInfo>
                   <mods:title>Epigrams</mods:title>
               </mods:titleInfo>
               <mods:name type="personal">
                   <mods:namePart>Martial</mods:namePart>
               </mods:name>
               <mods:name type="personal">
               <mods:namePart>Ker, Walter C. A. (Walter Charles Alan), 1853-1929
               </mods:namePart>
               </mods:name>
               <mods:typeOfResource>text</mods:typeOfResource>
               <mods:originInfo>
                   <mods:place>
                       <mods:placeTerm type="text">London</mods:placeTerm>
                   </mods:place>
                   <mods:publisher>William Heinemann</mods:publisher>
                   <mods:dateIssued point="start">1927</mods:dateIssued>
                   <mods:dateIssued point="end">1943</mods:dateIssued>
               </mods:originInfo>
               <mods:language>
                   <mods:languageTerm type="text">English</mods:languageTerm>
               </mods:language>
               <mods:physicalDescription>
                   <mods:extent>2 v.</mods:extent>
               </mods:physicalDescription>
               <mods:note>v. 1 has imprint: Cambridge, Ma. : Harvard University Press,
                1943</mods:note>
               <mods:note>Latin and English on opposite pages.</mods:note>
               <mods:subject authority="lcsh">
                   <mods:topic>Epigrams, Latin-Translations into English</mods:topic>
               </mods:subject>
               <mods:relatedItem type="series">
                   <mods:titleInfo>
                       <mods:title>Loeb classical library></mods:title>
                   </mods:titleInfo>
               </mods:relatedItem>
                   <mods:accessCondition>Unknown</mods:accessCondition>
               <mods:recordInfo>
                   <mods:recordContentSource>METS Editorial Board
                   </mods:recordContentSource>
                   <mods:recordCreationDate encoding="iso8601">20060316
                   </mods:recordCreationDate>
               </mods:recordInfo>
           </mods:mods>
       </mets:xmlData>
   </mets:mdWrap>
</mets:dmdSec>
```

OR

```
<dmdSec ID="dmd003">
       <mdWrap MIMETYPE="application/marc" MDTYPE="MARC" LABEL="OPAC  Record">
               <binData>MDI0ODdjam0gIDIyMDA1ODkgYSA0NU0wMDAxMDA...
                [base 64 encoded data goes here]
               </binData>
       </mdWrap>
</dmdSec>
```



<AMDSEC> ADMINISTRATIVE METADATA

The **Administrative Metadata Section** <amdSec> contains the administrative metadata pertaining to the digital object, its components and any original source material from which the digital object is derived. The <amdSec> is separated into four sub-sections that accommodate technical metadata (techMD), intellectual property rights (rightsMD), analog/digital source metadata (sourceMD), and digital provenance metadata (digiprovMD). Each of these subsections can either wrap the metadata (mdWrap) or reference it in an external location (mdRef) or both. Multiple instances of the <amdSec> element can occur within a METS document and multiple instances of its subsections can occur in one <amdSec> element. This allows considerable flexibility in the structuring of the administrative metadata.

METS does not define a vocabulary or syntax for encoding administrative metadata. Administrative metadata can be expressed within the <amdSec> sub-elements according to many current community

defined standards, or locally produced XML schemas. The METS Editorial Board has endorsed such community based content standards as the: MIX XML Schema, NISO Technical Metadata for Still Images, and TextMD: Schema for Technical Metadata for Text.[3] Other standards under review include: LC-AV (Audio /Video Technical Metadata Schema), and METSRightsMD Schema. Visit the METS website to ascertain what standards are currently endorsed.

The sub-sections of the <amdSec> follow the same content model as the <dmdSec> in that they can either include metadata within the METS document as an <mdWrap> element or reference it via an <mdRef> element.

ATTRIBUTES OF THE ADMINISTRATIVE METADATA SECTION

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

ELEMENTS CONTAINED IN THE ADMINISTRATIVE METADATA SECTION

The <amdSec> is partitioned into four major areas for the collocation of technical, rights, source and provenance metadata. Technical information <techMD> contains metadata about the component parts of the digital object. Intellectual property <rightsMD> enumerates rights notices and use restrictions. Information about the materials used to generate the digital object is stored in <sourceMD>. The history of the digital object is recorded in the provenance element <digiprovMD>. All of these elements use the same attributes.

ATTRIBUTES SHARED BY THE ADMINISTRATIVE METADATA ELEMENTS

ID (*ID/R*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. The ID attribute on the <techMD>, <sourceMD>, <rightsMD> and <digiprovMD> elements (which are all of mdSecType) is required, and its value should be referenced from one or more ADMID attributes that are associated with other elements in the METS document. The following elements support references to <techMD>, <sourceMD>, <rightsMD> and <digiprovMD> elements via an ADMID attribute: <metsHdr>, <dmdSec>, <techMD>, <sourceMD>, <rightsMD>, <digiprovMD>, <fileGrp>, <file>, <stream>, , <area>, <behavior>. For more information on using ID attributes for internal and external linking see Chapter 4.

GROUPID (*ID/O*): An identifier used to denote that different metadata sections may be considered as part of a single group. Two metadata sections with the same GROUPID value are to be considered part of the same group. This facility might be used, for example, to group changed versions of the same metadata if previous versions are maintained in a file for tracking purposes.

ADMID (IDREFS/O): Contains the ID attribute values of the <digiprovMD>, <techMD>, <sourceMD> and/or <rightsMD> elements within the <amdSec> of the METS document that contain administrative metadata pertaining to the current element. Typically used in this context to reference preservation metadata (digiprovMD) which applies to the current metadata element. For

---

3 MIX XML Schema: http://www.loc.gov/standards/mix/ NISO Technical Metadata for Still Images: http://www.niso.org/standards/resources/Z39_87_trial_use.pdf TextMD: http://dlib.nyu.edu/METS/textMD.xsd AudioMD: http://www.loc.gov/rr/mopic/avprot/audiomd_v8.xsd VideoMD: http://loc.gov.org/rr/mopic/avprot/videoMD_v8.xsd RightsDeclarationMD Schema: http://xml.coverpages.org/METS-Rights_LOC-csd:html

more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

CREATED (*dateTime/O*): An attribute that specifies the date and time of creation the metadata.

STATUS (*string/O*): Use to indicate the status of this metadata (e.g., superseded, current, etc.)

TECHNICAL METADATA

A **technical metadata** element <techMD> records technical metadata about a component of the METS object, such as a digital content file. The <techMD> element conforms to same generic datatype as the <dmdSec>, <rightsMD>, <sourceMD> and <digiprovMD> elements, and supports the same sub-elements and attributes. A technical metadata element can either wrap the metadata (mdWrap) or reference it in an external location (mdRef) or both. (For documentation on the attributes defined for the <mdRef> and <mdWrap> elements, see pages 26-29 above.) METS allows multiple <techMD> elements; and technical metadata can be associated with any METS element that supports an ADMID attribute Technical metadata can be expressed according to many current technical description standards (such as MIX and textMD) or a locally produced XML schema.

TECHNICAL METADATA – EXAMPLE

One might, for example, have a <techMD> element which includes technical metadata regarding a file's preparation:

```
<mets:techMD ID="AMD001">
      <mets:mdWrap MIMETYPE="text/xml" MDTYPE="NISOIMG" LABEL="NISO Img.Data">
            <mets:xmlData>
                  <niso:MIMEtype>image/tiff</niso:MIMEtype>
                        <niso:Compression>LZW</niso:Compression>
                              <niso:PhotometricInterpretation>8
                              </niso:PhotometricInterpretation>
                              <niso:Orientation>1</niso:Orientation>
                              <niso:ScanningAgency>NYU Press
                              </niso:ScanningAgency>
            </mets:xmlData>
      </mets:mdWrap>
</mets:techMD>
```

Within a file section, a <file> element within a <fileGrp> might then identify the administrative metadata pertaining to the file to which it points by referencing an ADMID attribute for its <techMD> element:

```
<mets:file ID="FILE001" ADMID="AMD001">
      <mets:FLocat LOCTYPE="URL"http://dlib.nyu.edu/press/testing.tif”/>
</mets:file>
```

INTELLECTUAL PROPERTY RIGHTS METADATA

A **intellectual property rights metadata** element <rightsMD> records information about copyright and licensing pertaining to a component of the METS object. The <rightsMD> element conforms to same generic datatype as the <dmdSec>, <techMD>, <sourceMD> and <digiprovMD> elements, and supports the same sub-elements and attributes. A rights metadata element can either wrap the metadata (mdWrap) or reference it in an external location (mdRef) or both. (For documentation on the attributes defined for the <mdRef> and <mdWrap> elements, see pages 26-29 above.) METS allows multiple <rightsMD> elements; and rights metadata can be associated with any METS element that supports an ADMID attribute. Rights metadata can be expressed according current rights description standards (such as CopyrightMD and rightsDeclarationMD) or a locally produced XML schema.

INTELLECTUAL PROPERTY RIGHTS METADATA – EXAMPLE

```
<mets:rightsMD ID="ADMRTS1">
   <mets:mdWrap MDTYPE="OTHER" OTHERMDTYPE="METSRights">
       <mets:xmlData>
           <rts:RightsDeclarationMD RIGHTSCATEGORY="PUBLIC DOMAIN">
               <rts:Context CONTEXTCLASS="GENERAL PUBLIC">
                   <rts:Constraints CONSTRAINTTYPE="RE-USE">
                       <rts:ConstraintDescription>This volume was published in Great
                        Britain in 1927 by William Heineman (London) with a reference to
                        G.P. Putnam's Sons in New York.  (The verso of the title page says
                        "Printed in Great Britain" and notes that is was originally
                        published in 1920 and reprinted in 1927).  Because this work was
                        published abroad before 1978 without compliance with US Copyright
                        formalities and because it entered the public domain in its home
                        country as of 1 January 1996, it is now also considered in the
                        public domain in the United States without any constraints on use.
                       </rts:ConstraintDescription>
                   </rts:Constraints>
               </rts:Context>
           </rts:RightsDeclarationMD>
       </mets:xmlData>
   </mets:mdWrap>
</mets:rightsMD>
```

SOURCE METADATA

A source metadata element <sourceMD> records descriptive and administrative metadata about the source format or media of a component of the METS object such as a digital content file. It is often used for discovery, data administration or preservation of the digital object. The <sourceMD> element conforms to same generic datatype as the <dmdSec>, <techMD>, <rightsMD>, and <digiprovMD> elements, and supports the same sub-elements and attributes. A source metadata element can either wrap the metadata (mdWrap) or reference it in an external location (mdRef) or both. (For documentation on the attributes defined for the <mdRef> and <mdWrap> elements, see pages 26-29 above.) METS allows multiple <sourceMD> elements; and source metadata can be associated with any METS element that supports an ADMID attribute. Source metadata can be expressed according to current source description standards (such as PREMIS) or a locally produced XML schema.

SOURCE METADATA – EXAMPLE

For our *Epigrams* example digital object, we could have used <sourceMD> to link to the MARC record describing the print version of the book from which the images were derived. As another example, when a digital audio object is created from an open reel tape, we can record important technical metadata about the tape in <sourceMD> within an <mdWrap> element as follows:

```
     <sourceMD ID="SMD_MJF_Tape_0010_Side_A" STATUS="Draft, unformatted"
       CREATED="2006-08-28T15:36:53">
       <mdWrap MDTYPE="OTHER" OTHERMDTYPE="Draft AES-X098-SC-03-06-B,
version 2006-05-19"
         MIMETYPE="audio/x-wave">
         <xmlData>
           <dataroot xmlns:od="urn:schemas-microsoft-com:officedata"
generated="2006-08-28T15:36:53">
             <!-All values for source elements come from the
source_metadata table.->
             <source>
               <ID>1</ID>
               <source_metadata_id>SRC000000001</source_metadata_id>
               <item_face_id_fk>IF000000001</item_face_id_fk>
               <identifier>0001</identifier>
               <identifier_type>MJF tape number</identifier_type>
               <direction>A_PASS</direction>
               <source_format_type>open reel tape</source_format_type>
               <analog_digital_flag>analog</analog_digital_flag>
               <speed>7.5</speed>
               <speed_unit>Inches per second</speed_unit>
               <track_format>half track</track_format>
               <sound_field>stereo</sound_field>
               <noise_reduction>none</noise_reduction>
               <equalization>none</equalization>
               <gauge>0.25</gauge>
               <gauge_unit>Inches</gauge_unit>
               <reel_diameter>7</reel_diameter>
               <reel_diameter_unit>Inches</reel_diameter_unit>
               <bit_depth/>
               <sample_rate/>
             </source>
           </dataroot>
         </xmlData>
       </mdWrap>
     </sourceMD>
```

DIGITAL PROVENANCE METADATA

The **digital provenance metadata** element <digiprovMD> can be used to record any preservation-related actions taken on the various files which comprise a digital object (e.g., those subsequent to the initial digitization of the files such as transformation or migrations) or, in the case of born digital materials, the files' creation. In short, digital provenance should be used to record information that allows both archival/library staff and scholars to understand what modifications have been made to a digital object and/or its constituent parts during its life cycle. This information can then be used to judge how those processes might have altered or corrupted the object's ability to accurately represent the original item. One might, for example, record master derivative relationships and the process by which those derivations have been created. Or the <digiprovMD> element could contain information regarding the migration/transformation of a file from its original digitization (e.g., OCR, TEI, etc.,)to its current incarnation as a digital object (e.g., JPEG2000).

The <digiprovMD> element conforms to same generic datatype as the <dmdSec>, <techMD>, <rightsMD>, and <sourceMD> elements, and supports the same sub-elements and attributes. A digital provenance metadata element can either wrap the metadata (mdWrap) or reference it in an external location (mdRef) or both. (For documentation on the attributes defined for the <mdRef> and <mdWrap> elements, see pages 26-29 above.) METS allows multiple <digiprovMD> elements; and digital provenance metadata can be associated with any METS element that supports an ADMID attribute. Digital provenance metadata can be expressed according to current digital provenance description standards (such as PREMIS) or a locally produced XML schema.

DIGITAL PROVENANCE METADATA – EXAMPLE 1:

```
<mets:digiprovMD  ID="FPRV24_551">
           <mets:xmlData>
               <mets:mdWrap MDTYPE="OTHER" OTHERMDTYPE="oclcprov">
                   <mets:oclcprov:oclcprov>
                       <oclcprov:digiprovMD>
                           <oclcprov:fixityAlgorithm>Adler-32 </oclcprov:fixityAlgorith>
                           <oclcprov:fixityCheckResults>202947597</oclcprov:fixityCheckResults>
                           <oclcprov:fixityCheckStatus>Success</oclcprov:fixityCheckStatus>
                           <oclcprov:fixityCheckDate>2006-05-15T09:17:49
                           </oclcprov:fixityCheckDate>
                           <oclcprov:virusSoftware>McAfee Virus Scan for Linux  v.4.40.0
                           </oclcprov:virusSoftware>
                           <oclcprov:virusCheckStatus>Success</oclcprov:virusCheckStatus>
                           <oclcprov:virusCheckDate>2006-05-15T09:17:49</oclcprov:virusCheckDate>
                           <oclcprov:mimeType>application/pdf</oclcprov:mimeType>
                       </oclcprov:digiprovMD>
                   </mets:oclcprov:oclcprov>
               </mets:mdWrap>
           </mets:xmlData>
       </mets:digiprovMD>
```

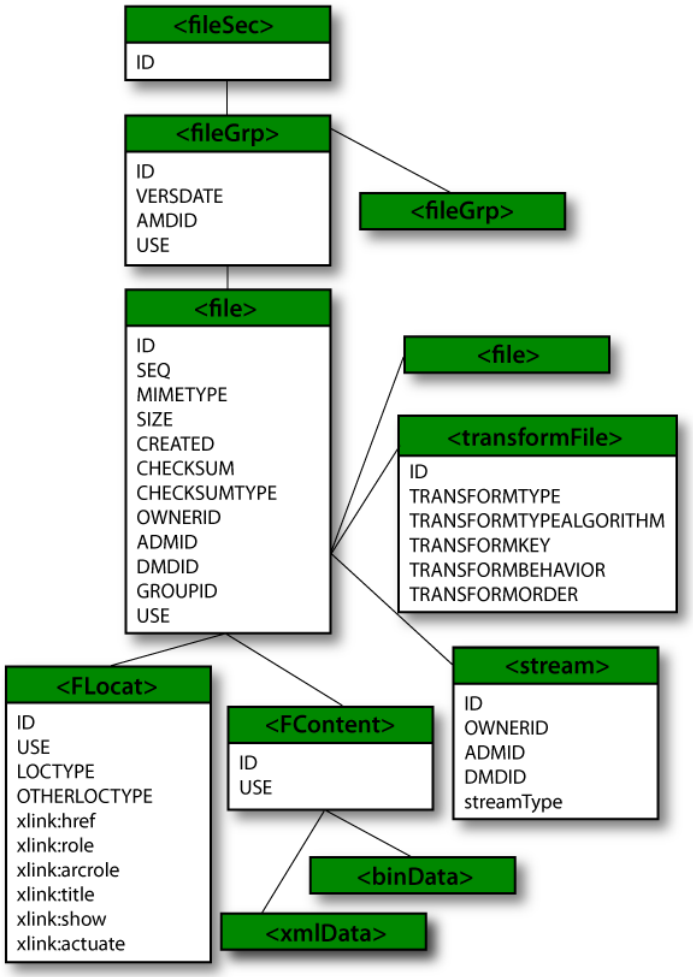
DIGITAL PROVENANCE METADATA – EXAMPLE 2

```
<mets:digiprovMD ID="DP_0755ad93-5fd1-11da-b211-19e7a5cf4814"
 CREATED="2006-11-27T21:37:13">
   <mets:mdWrap MDTYPE="PREMIS"
       <mets:xmlData xmlns:premis=http://www.loc.gov/standards/premis/v1
        xsi:schemaLocation="http://www.loc.gov/standards/premis/v1 http://www.loc.gov/
        standards/premis/v1/Event-v1-1.xsd">
          <premise:eventIdentifier>
              <premise:eventIdentifierType>Validation
              </premises:eventIdentifierType>
              <premise:eventIdentifierType>Ingest_Validation_01
              </premis:eventIdentifierValue>
          </premise:eventIdentifier>
          <premis:eventType>Validation</premis:eventType>
          <premis:eventDateTime>2006-11-27-08:00</premis:eventDateTime>
          <premis:eventDetail>ValidationResults</premis:eventDetail>
          <premis:eventOutcomeInformation>
              <premis:eventOutcome>Pass</premis:eventOutcome>
              <premis:eventOutcomeDetail>
                  <ingestValidation ID="FILE_epi01m.tiff">
                      <JhoveOutput>File is of format: TIFF. The file is well
                       -formed. The file is valid. </JhoveOutput>
                      <IngestValidatorOutput>The computed checksum matches the
                       original checksum for file[file:90990250/90990250.pdf]
                      </IngestValidatorOutput>
                      <IngestValidatorOutput>Original file ID: FILE_epi01m.tiff
                       has been changed to FILE_07108e3e-5fd1-11da-b211-
                       19e7a5cf4814
                      </IngestValidatorOutput>
                      <IngestValidatorOutput>Original file name eip01m>tiff has
                       been changed to FILE_07108e3e-5fd1-11da-b211-
                       19e7a5cf4814,pdf
                      </IngestValidatorOutput>
                  </ingestValidation>
              </premis:eventOutcomeDetail>
          </premis:eventOutcomeInformation>
              <premis:linkingAgentIdentifier>
              <premis:linkingAgentIdentifierType>"Software"/>
              <premis:linkingAgentIdentifierValue>"JHove"/>
              </premis:linkingAgentIdentifier>
              <premis:linkingAgentIdentifier>
              <premis:linkingAgentIdentifierType>"Software"/>
              <premis:linkingAgentIdentidierValue>"SDR_Ingest_Validator"/>
              </premis:linkingAgentIdentidier>
          </premis:event>
       </mets:xmlData>
   </mets:mdWrap>
</mets:digiprovMD>
```

Other examples for implementing PREMIS can be found on the PREMIS Implemention Group (PIG) wiki.

COMPLETE ADMINISTRATIVE METADATA – EXAMPLE

For this example please see lines 66 – 1786 of the full example in Appendix A.



<FILE> FILE SECTION

The overall purpose of the content **file section** element <fileSec> is to provide an inventory of and the location for the content files that comprise the digital object being described in the METS document. This element contains a <fileGrp> element which allows files to be grouped together for various purposes (e.g., by format or use). Within each <fileGrp> there is a <file> element for each file that comprises the encoded document; the <fileGrp> elements may also be used to bring together related files that are relevant to the composition or rendering of the digital object being described.

<fileGrp> may point to pertinent administrative metadata elements in the Administrative Metadata Section <amdSec> of the METS document by means of an ADMID attribute. Such administrative information might include technical information about the <fileGrp>:

- <techMD> – technical information about the file group
- <rightsMD> – for details such as access restrictions or other rights information
- <sourceMD> – information about the original object
- <digiprovMD> – information about the preservation aspects of the file group such as provenance or the transformations to which the file group has been submitted.

Similarly, <file>s within a <fileGrp> may point to administrative information using an ADMID attribute, and also descriptive information using the DMDID attribute. See <fileGrp> discussion below.

ATTRIBUTES OF THE FILE SECTION

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.Elements contained in the file section

ELEMENTS CONTAINED IN THE FILE SECTION

FILE GROUP

A sequence of file group elements <fileGrp> can be used group the digital files comprising the content of a METS object either into a flat arrangement or, because each file group element can itself contain one or more file group elements, into a nested (hierarchical) arrangement. In the case where the content files are images of different formats and resolutions, for example, one could group the image content files by format and create a separate <fileGrp> for each image format/resolution such as:

- one <fileGrp> for the thumbnails of the images
- one <fileGrp> for the higher resolution JPEGs of the image
- one <fileGrp> for the master archival TIFFs of the images

For a text resource with a variety of content file types one might group the content files at the highest level by type, and then use the <fileGrp> element's nesting capabilities to subdivide a <fileGrp> by format within the type, such as:

- one <fileGrp> for all of the page images with nested <fileGrp> elements for each image format/resolution (tiff, jpeg, gif)
- one <fileGrp> for a PDF version of all the pages of the document
- one <fileGrp> for a TEI encoded XML version of the entire document or each of its pages.

A <fileGrp> may contain zero or more <fileGrp> elements and or <file> elements.As described below, a <file> element may contain <FLocat> pointers to one or more external content files via a URI and/or may itself contain the file content as XML or binary data using the <FContent> element.

FILE GROUP – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

VERSDATE (*dateTime/O*): The version date for the file grouping.

ADMID (*IDREFS/O*): Contains the ID attribute values of the <techMD>, <sourceMD>, <rightsMD> and/or <digiprovMD> elements within the <amdSec> of the METS document applicable to all of the files in a particular file group. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

USE (*string/O*): A tagging attribute to indicate the intended use of files within this file group (e.g., master, reference, thumbnails for image files). A USE attribute can be expressed at the<fileGrp level>, the <file> level, the <FLocat> level and/or the <FContent> level. A USE attribute value at the <fileGrp> level should pertain to all of the files in the <fileGrp>. A USE attribute at the <file> level should pertain to all copies of the file as represented by subsidiary <FLocat> and/or <FContent> elements. A USE attribute at the <FLocat> or <FContent> level pertains to the particular copy of the file that is either referenced (<FLocat>) or wrapped (<FContent>).

FILE GROUP – EXAMPLE

The following METS fragment represents the page images of a book that are in TIFF format. Other <fileGrp>s in this situation may be those which pull together the JPEG or the GIF manifestations of the same page images. The following METS fragment represents the TIFF page images of a book:

```
<mets:mets xmlns:mets="http://www/loc.gov/METS/" xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:xlink="http://www.w3c.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation=" http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd http://www.loc.gov.mods.v3
http://www.loc.gov/mods/v3/mods-3-1.xsd" OBJID="ark:/13010/kt9s2009hz" LABEL="Martial
Epigrams">
...
      <mets:fileSec>
            <mets:fileGrp ID="TIFF_GRP01" USE="MASTER IMAGE">
            . . .
      </mets:fileSec>
```

There may be other <fileGrp>s in this situation that pull together JPEG or GIF manifestations of the same pages.

FILE (ELEMENT)

The **file element** <file> provides access to the content files for the digital object being described by the METS document. A <file> element may contain one or more <FLocat> elements which provide pointers to a content file and/or a <FContent> element which wraps an encoded version of the file. Embedding files using <FContent> can be a valuable feature for exchanging digital objects between repositories or for archiving versions of digital objects for off-site storage. All <FLocat> and <FContent> elements should identify and/or contain identical copies of a single file. The <file> element is recursive, thus allowing sub-files or component files of a larger file to be listed in the inventory. For example, files contained within an archive tar or zip file could be represented this way. Alternatively, by using the <stream> element, a smaller component of a file or of a related file can be placed within a <file> element. Finally, by using the <transformFile> element, it is possible to include within a <file> element a different version of a file that has undergone a transformation for some reason, such as format migration.

FILE (ELEMENT) – ATTRIBUTES

ID (*ID/R*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. Typically, the ID attribute value on a <file> element would be referenced from one or more FILEID attributes (which are of type IDREF) on <fptr>and/or <area> elements within the <structMap>. Such references establish links between structural divisions (elements) and the specific content files or parts of content files that manifest them. For more information on using ID attributes for internal and external linking see Chapter 4.

MIMETYPE (*string/O*): The IANA MIME media type for the file. Some values for this attribute can be found on the IANA website.

SEQ (*integer/O*): Indicates the sequence of this <file> relative to the others in its <fileGrp>.

SIZE (*integer/O*): The size of the file in bytes.

CREATED (*dateTime/O*): The date of creation for the file.

CHECKSUM (*string/O*): The checksum value for this file.

CHECKSUMTYPE (*string/O*): The type of checksum in the CHECKSUM attribute. When used it must be one of the following: *HAVAL, MD5, SHA-256, SHA-384, SHA-512, TIGER, WHIRLPOOL*

OWNERID (*string/O*): A unique identifier assigned to file by its owner. This may be a URI which differs from the URI used to retrieve the file.

ADMID (*IDREFS/O*): Contains the ID attribute values of the <techMD>, <sourceMD>, <rightsMD> and/or <digiprovMD> elements within the <amdSec> of the METS document that contain administrative metadata pertaining to the file. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

DMDID (*IDREFS/O*): Contains the ID attribute values identifying the <dmdSec>, elements in the METS document that contain or link to descriptive metadata pertaining to the content file represented by the current <file> element. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

GROUPID (*string/O*): An identifier that establishes a correspondence between this file and files in other file groups. Typically, this will be used to associate a master file in one file group with derivative files made from it in other file groups.

USE (*string/O*): A tagging attribute to indicate the intended use of all copies of the file aggregated by the <file> element (e.g., master, reference, thumbnails for image files). A USE attribute can be expressed at the<fileGrp> level, the <file> level, the <FLocat> level and/or the <FContent> level. A USE attribute value at the <fileGrp> level should pertain to all of the files in the <fileGrp>. A USE attribute at the <file> level should pertain to all copies of the file as represented by subsidiary <FLocat> and/or <FContent> elements. A USE attribute at the <FLocat> or <FContent> level pertains to the particular copy of the file that is either referenced (<FLocat>) or wrapped (<FContent>).

FILE (ELEMENT) – EXAMPLE

The physical book example that we have been using represents each page by s, one for each of the three different image manifestations (TIFF, JPEG, or GIF). The <fileGrp> of the TIFF images is represented in the following example as a single file within that group.

```
<?xml version="1.0" encoding="UTF-8">
<mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods="http://www/loc.gov/mods/v3"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www/w3/org/2001/XMLSchema-instance"
xsi:schemalocation="http://www.loc.gov/METS http://www/loc/gov/standards/mets/mets.xsd
http://www/loc/gov/mods/v3/mods-3-1.xsd" OBJID="ark:/13010/kt9s2009hz" LABEL="Martial
Epigrams">
...
      <mets:fileSec>
            <mets:fileGrp ID="TIFF_GRP01" USE="MASTER IMAGE">
                  < mets:file ID="epi01m" SIZE="65768" CREATED="2006-04-11T07:35:22
                   "MIMETYPE="image/tiff" ADMID="MIX_v1.0_TIFF_epi01m">
                  . . .
                  </mets:file>
            </mets:fileGrp>
      </mets:fileSec>
```

FILE LOCATION

The **file location** element <FLocat> provides a pointer to the location of a content file. It uses the XLink reference syntax to provide linking information indicating the actual location of the content file, along with other attributes specifying additional linking information.

NOTE: <FLocat> is an empty element. The location of the resource pointed to MUST be stored in the xlink:href attribute.

FILE LOCATION – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

LOCTYPE (*string/R*): Specifies the locator type used in the xlink:href attribute. Valid values for LOCTYPE are: *ARK, URN, URL, PURL, HANDLE, DOI, OTHER*.

OTHERLOCTYPE (*string/O*): Specifies the locator type when the value OTHER is used in the LOCTYPE attribute. Although optional, it is strongly recommended when OTHER is used.

USE (*string/O*): A tagging attribute to indicate the intended use of the specific copy of the file element represented by the <FLocat> element (e.g., service master, archive master). A USE attribute can be expressed at the<fileGrp> level, the <file> level, the <FLocat> level and/or the <FContent> level. A USE attribute value at the <fileGrp> level should pertain to all of the files in the <fileGrp>. A USE attribute at the <file> level should pertain to all copies of the file as represented by subsidiary <FLocat> and/or <FContent> elements. A USE attribute at the <FLocat> or <FContent> level pertains to the particular copy of the file that is either referenced (<FLocat>) or wrapped (<FContent>).

Additional information on the following XLink attributes can be found on the W3C website.

xlink:href (*URI/O*): Technically optional, this attribute provides the URI indicating where the content file represented by the parent file can be located. The xlink:href should always be present in this context if the <FLocat> is to have any meaning or use. This attribute is defined as part of the xlink:simpleLink attribute group.

xlink:role (*URI/O*): This attribute serves a semantic purpose. If present, it specifies the URI of a resource that describes the role or function of the xlink:href link. This attribute is defined as part of the xlink:simpleLink attribute group. It must be a URI reference as defined in IETF RFC 2396, except that, if the URI scheme used allows for absolute and relative forms, the URI portion must be absolute.

xlink:arcrole (*URI/O*): If present this attribute serves a semantic purpose. It specifies the URI of a resource that describes the pertinent arc or pointer to the remote resource. While more likely to be used in arcLinks than simpleLinks, this attribute nonetheless is defined as part of the xlink:simpleLink attribute group. This must be a URI reference as defined in IETF RFC 2396 and, if the URI scheme used allows for an absolute or a relative form, the URI portion must be absolute.

xlink:title (*string/O*): Used to describe the meaning of a link or resource in a human-readable fashion, this attribute serves a semantic purpose.

xlink:show (*string/O*): Within a simpleLink this attribute signals behavior intended to traverse to the simpleLink's single remote ending resource. It must contain one of the following values: *new, replace, embed, other, none*.

xlink:actuate (*string/O*): Specifies behavior within a simpleLink, signaling behavioral intentions for the traversal to simpleLink's single remote ending resource. It must contain one of the following values: *onLoad, onRequest, other, none*.

FILE LOCATION – EXAMPLE

In the following example, the <fileGrp> of the TIFF images is represented as is a single <file> within that group and the file location:

```
<?xml version="1.0" encoding="UTF-8"?>
<mets:mets xmlns:mets="http://www/loc/gov/METS/"
xmlns:mods="http://www/loc/gov/,ods/v3/"
xmlns:xlink="http://www/w3/org/1999/xlink"
xmlns:xsi="http://www/w3/org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www/loc/gov/METS/ http://www/loc/gov/standards/mets/mets.xsd
http://www/loc.gov/mods/v3 http://www/loc/gov/mods/v3/mods-3-
1.xsd"OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams">
...
<mets:fileSec>
   <mets:fileGrp ID="TIFF_GRP01" USE="MASTER IMAGE">
       <mets:file ID="epi01m" SIZE="65768" CREATED="2006-04-11T07:35:22" MIMETYPE=
        "image/tiff" ADMID="MIX_v1.0_TIFF_epio1m">
          <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/full/
           01.tiff" LOCTYPE="URL"/>
          <mets:/FLocat>
       </mets:file>
   </mets:fileGrp>
</mets:fileSec>
```

FILE CONTENT

The **file content** element <FContent> is used to identify a content file contained internally within a METS document. The content file must be either Base64 encoded and contained within the subsidiary <binData> wrapper element, or consist of XML information and be contained within the subsidiary <xmlData> wrapper element. An xml data element <xmlData> is used to contain an XML encoded file. The content of an <xmlData> element can be in any namespace or in no namespace. As permitted by the XML Schema Standard, the processContents attribute value for the metadata in an <xmlData> element is set to "lax". Therefore, if the source schema and its location are identified by means of an xsi:schemaLocation attribute, then an XML processor will validate the elements for which it can find declarations. If a source schema is not identified, or cannot be found at the specified schemaLocation, then an XML validator will check for well-formedness, but otherwise skip over the elements appearing in the <xmlData> element. METS default encoding scheme is UTF-8 Unicode.

FILE CONTENT – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

USE (*ID:O*): A tagging attribute to indicate the intended use of the specific copy of the file represented by the <FContent> element (e.g., service master, archive master). A USE attribute can be expressed at the<fileGrp> level, the <file> level, the <FLocat> level and/or the <FContent> level. A USE attribute value at the <fileGrp> level should pertain to all of the files in the <fileGrp>. A USE attribute at the <file> level should pertain to all copies of the file as represented by subsidiary <FLocat> and/or <FContent> elements. A USE attribute at the <FLocat> or <FContent> level pertains that the particular copy of the file that is either referenced (<FLocat>) or wrapped (<FContent>).

FILE CONTENT – EXAMPLE

```
<?xml version="1.0" encoding="UTF-8"?>
<mets:mets xmlns:mets="http://www/loc/gov/METS/"
xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.loc.gov/standards/mets/mets.xsd
http://www/loc/gov/mods/v3/mods-3-1.xsd"
OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams">
...
       <mets:fileSec>
              <mets:fileGrp ID="TIFF_GRP01" USE="MASTER IMAGE">
                     <mets:file ID="epi01m" SIZE="65768" CREATED="2006-04-11T07:35:22"
                      MIMETYPE="image/tiff" ADMID="MIX_v1.0_TIFF_epio1m">
                            <mets:FContent ID="eip01m.tiff" USE="Preservation Master">
                                   <mets:binData>[base 64 encoded data goes
here]</binData>
                            </mets:FContent>
                     </mets:file>
              </mets:fileGrp>
       <mets:fileSec>
```

COMPONENT BYTE STREAM

A **component byte stream** element <stream> may be composed of one or more subsidiary streams. An MPEG4 file, for example, might contain separate audio and video streams, each of which is associated with technical metadata. The repeatable <stream> element provides a mechanism to record the existence of separate data streams within a particular file, and the opportunity to associate <dmdSec> and <amdSec> with those subsidiary data streams if desired.

COMPONENT BYTE STREAM – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

streamType (*string/O*): The IANA MIME media type for the bytestream.

OWNERID (*string/O*): Used to provide a unique identifier (which could include a URI) assigned to the file. This identifier may differ from the URI used to retrieve the file.

AMDMDID (*IDREFS/O*): Contains the ID attribute values of the <techMD>, <sourceMD>, <rightsMD> and/or <digiprovMD> elements within the <amdSec> of the METS document that contain administrative metadata pertaining to the bytestream. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

DMDID (*IDREFS/O*): Contains the ID attribute values identifying the <dmdSec>, elements in the METS document that contain or link to descriptive metadata pertaining to the content file stream represented by the current <stream> element. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

COMPONENT BYTE STREAM – EXAMPLE

Excerpted in the following simplified example is a file section from a digital object for an oral history interview which is expressed in three different formats:

- a TEI-encoded transcript
- a master audio file in WAV format
- a derivative audio file in MP3 format

Within the TEI-encoded transcript is embedded a fragment of the audio file in WAV format which expresses the oral representation of a given section of the transcript. The XML fragment for the mixed content file could be illustrated as follows:

```
<mets:fileSec>
   <mets:fileGrp ID="FORMAT1" USE="Transcription">
       <mets:file ID="FILE001" MIMETYPE="application/xml" SIZE="257537" CREATED="2001-06-
   10">
           <mets:FLocat LOCTYPE="URL" xlink:href="http://dlib.nyu.edu/tamwag/beame.xml"
           </mets:FLocat>
       </mets:file>
   </mets:fileGrp>
   <mets:fileGrp ID="FORMAT2" USE="Master Audio">
       <mets:file ID="FILE002" MIMETYPE="audio/wav" SIZE="64232836" CREATED="2001-05-17"
        GROUPID="AUDIO1">
           <mets:FLocat LOCTYPE="URL" xlink:href="http://dlib/nyu.edu/tamwag/beame.wav"
           </mets:FLocat>
       </mets:file>
   </mets:fileGrp>
   <mets:fileGrp ID="MIXEDFORMAT" VERSDATE="2005-4-14" USE="Master Component Playback">
       <mets:file ID="FILE004_01" MIMETYPE="application/xml" SIZE="2566764"
        CREATED="2005-4-14">
           <mets:FLocat LOCTYPE="URL"
   xlink:href="http://dlib.nyu.edu/tamwag/beame_comp01.xml"/>
           <mets:stream ID="BEAME_COMP_01" streamType="AUDIO/X-WAV" OWNERID=
                "HIST_DEPT05_BEAME_COMP_O1" DMDID="MODS_BEAME_COMP_01"/>

       </mets:file>
   </mets:fileGrp>
</mets:fileSec>
```

TRANSFORM FILE

The **transform file** <transformFile> element provides a means to access any subsidiary files listed below a <file> element by indicating the steps required to "unpack" or transform the subsidiary files. This element is repeatable and might provide a link to a <behavior> in the <behaviorSec> that performs the transformation.

TRANSFORM FILE – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

TRANSFORMTYPE (*string/R*): Is used to indicate the type of transformation needed to render content of a file accessible. This may include unpacking a file into subsidiary files/streams. The controlled value constraints for this XML string include "decompression" and "decryption". Decompression is defined as the action of reversing data compression, i.e., the process of encoding information using fewer bits than an unencoded representation would use by means of specific encoding schemas. Decryption is defined as the process of restoring data that has been obscured to make it unreadable without special knowledge (encrypted data) to its original form.

TRANSFORM-ALGORITHM (*string/R*): Specifies the decompression or decryption routine used to access the contents of the file. Algorithms for compression can be either loss-less or lossy.

TRANSFORMKEY (*string/O*): A key to be used with the transform algorithm for accessing the file's contents.

TRANSFORM-BEHAVIOR (*string/O*): An IDREF to a behavior element for this transformation.

TRANSFORMORDER (*postive-integer/R*): The order in which the instructions must be followed in order to unpack or transform the container file.

TRANSFORM FILE – EXAMPLE

The following example describes a *.tar.gz file which has two embedded files within it, one a TIFF file and the other a JPEG file of the same image. To use the <fileSec> to describe these files, you could use the <transformFile> element in the following way:

```
<mets:fileSec ID="TransformEX_01">
   <mets:fileGrp  ID="TAR_GZ_container_01"  USE="Container">
       <mets:file  MIMETYPE="application/tar.gz" USE="Container">
           <mets:FLocat  xlink:href="file:sample01.tar.gz" ID="sampleTar01.gz"
            LOCTYPE="URL" />
              <mets:transformFile TRANSFORMORDER="1" TRANSFORMTYPE="decompression"
               TRANSFORMALGORITHM="gunzip">

              <mets:transformFile TRANSFORMORDER="2" TRANSFORMTYPE="decompression"
               TRANSFORMALGORITHM="tar">
              </mets:transformFile>
              <mets:file SEQ="1" MIMETYPE="image/tiff" CHECKSUM=
              "c1b82611e48066016ceb8daa93d46de7"CHECKSUMTYPE="MD5">
           <mets:FLocat  xlink:href="file:sample01_image01.tiff" LOCTYPE="URL"
            USE="Archival Master"/>
       </mets:file>
       <mets:file SEQ="2" MIMETYPE="image/jpeg" CHECKSUM=
           "c3cb82611e48066016ceb8daa93d46df5" CHECKSUMTYPE="MD5">
           <mets:FLocat  xlink:href="file:sample01_image01jpeg"
           LOCTYPE="URL"USE="Display Derivative"/>
       </mets:file>
   </mets:fileGrp>
</mets:fileSec>
```

COMPLETE FILE SECTION – EXAMPLES

COMPLETE FILE SECTION – EXAMPLE 1

Each physical page from the book has is represented by three associated content files in the TIFF, JPEG and GIF formats.

```
<?xml version="1.0" encoding="UTF-8"?>
<mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods=
"http://www.loc.gov/mods/v3" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.loc.gov/METS/ http://www.loc.gov/standards/mets/mets.xsd
http://www.loc.gov/mods/v3 http://www.loc.gov/mods/v3/mods-3-1.xsd"
OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams">
...
<mets:fileSec>
   <mets:fileGrp USE="MASTER IMAGE">
       <mets:file ID="epi01m" MIMETYPE="image/tiff">
           <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/full/01/
            tif”LOCTYPE="URL"/>
       </mets:file>
       <mets:file ID="epi02m" MIMETYPE="image/tiff">
           <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/full/
            02.tif”LOCTYPE="URL"/>
       </mets:file>
       <mets:file ID="epi03m" MIMETYPE="image/tiff">
           <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/full/
            03.tif”LOCTYPE="URL"/>
       </mets:file>
       <mets:file ID="epi04m" MIMETYPE="image/tiff">
           <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/full/
            04.tif”LOCTYPE="URL"/>
       </mets:file> ...
   </mets:fileGrp>
   <mets:fileGrp USE="REFERENCE IMAGE">
       <mets:file ID="epi01r" MIMETYPE="image/jpeg">
           <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
            01.jpg”LOCTYPE="URL"/>
       </mets:file>
       <mets:file ID="epi02r" MIMETYPE="image/jpeg">
           <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
                02.jpg”LOCTYPE="URL"/>
       </mets:file> <mets:file ID="epi03r" MIMETYPE="image/jpeg">
           <mets:FLocat xlink:href= “http://www.loc.gov/standards/mets/docgroup/jpg/
            03.jpg LOCTYPE="URL"/>
       </mets:file>
       <mets:file ID="epi04r" MIMETYPE="image/jpeg">
           <mets:FLocat xlink:href= “http://www.loc.gov/standards/mets/docgroup/jpg/
            04.jpg “LOCTYPE="URL"/>
       </mets:file> ...
   </mets:fileGrp>
   <mets:fileGrp USE="THUMBNAIL IMAGE">
       <mets:file ID="epi01t" MIMETYPE="image/gif">
           <mets:FLocat xlink:href=“http://www.loc.gov/standards/mets/docgroup/gif/
            01.gif” LOCTYPE="URL"/>
       </mets:file>
       <mets:file ID="epi02t" MIMETYPE="image/gif">
           <mets:FLocat xlink:href=“http://www.loc.gov/standards/mets/docgroup/gif/02.gif
            ”LOCTYPE="URL"/>
       </mets:file>
       <mets:file ID="epi03t" MIMETYPE="image/gif">
           <mets:FLocat xlink:href=“http://www.loc.gov/standards/mets/docgroup/gif/03.gif
            ”LOCTYPE="URL"/>
       </mets:file>
       <mets:file ID="epi04t" MIMETYPE="image/gif">
           <mets:FLocat xlink:href=“http://www.loc.gov/standards/mets/docgroup/gif/04.gif
            ”LOCTYPE="URL"/>
       </mets:file> ...
   </mets:fileGrp>
</mets:fileSec>
</mets:mets>
```

COMPLETE FILE SECTION – EXAMPLE 2

Again, consider the example of a <fileSec> for an oral history interview which is expressed in three different formats:

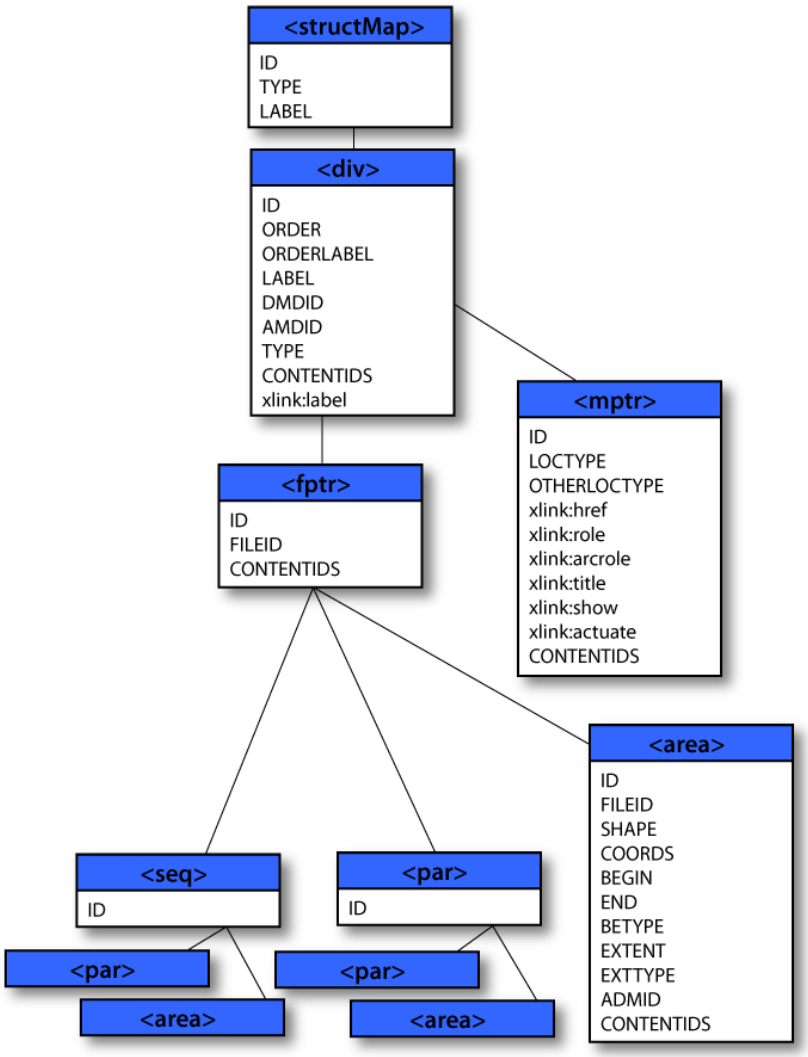
- a TEI-encoded transcript
- a master audio file in WAV format
- a derivative audio file in MP3 format.

In this case, the <fileSec> contains three subsidiary <fileGrp> elements, one for each different format of the object. The first is an XML-encoded transcription file, the second is a master audio file in WAV format, and the third is a derivative audio file in MP3 format. While such a basic example does not really seem to need the <fileGrp> elements to distinguish the different versions of the object, it does llustrate how <fileGrp> could be useful for objects consisting of large numbers of scanned page images, or indeed any case where a single version of the object consists of a large number of files. In those cases, being able to separate <file> elements into <fileGrp> elements makes identifying the files that belong to a particular version of the document a simple task.

Note the presence of the GROUPID attributes with identical values in the two audio <file> elements, "AUDIO01." These indicate that the two files, while belonging to different formats of the object, contain the same basic information. You can use the GROUPID in the same way to indicate equivalent page image files in digital library objects containing many scanned page images.

The XML fragment of the mixed format digital object could be illustrated as follows:

```
<mets:fileSec>
   <mets:fileGrp ID="FORMAT1" USE="Transcription">
       <mets:file ID="FILE001" MIMETYPE="application/xml" SIZE="257537" CREATED=
        "2001-06-10">
          <mets:FLocat LOCTYPE="URL" http://dlib.nyu.edu/tamwag/beame.xml
          </mets:FLocat>
       </mets:file>
   </mets:fileGrp>
   <mets:fileGrp ID="FORMAT2" USE="Master Audio"> <file ID="FILE002" MIMETYPE="audio/wav"
    SIZE="64232836" CREATED="2001-05-17" GROUPID="AUDIO1">
       <mets:FLocat LOCTYPE="URL" http://dlib.nyu.edu/tamwag/beame.wav
       </mets:FLocat>
   </mets:fileGrp>
   <mets:fileGrp ID="FORMAT3" VERSDATE="2001-05-18" USE="Derivative Audio">
       <mets:file ID="FILE003" MIMETYPE="audio/mpeg" SIZE="8238866" CREATED="2001-05-18"
        GROUPID="AUDIO1">
          <mets:FLocat LOCTYPE="URL" http://dlib.nyu.edu/tamwag/beame.mp3
          </mets:FLocat>
       </mets:file>
   </mets:fileGrp>
</mets:fileSec>
```



<STRUCTMAP> STRUCTURAL MAP SECTION

The **structural map section** <structMap> is the heart of a METS document. It provides a means for organizing the digital content represented by the <file> elements in the <fileSec> of the METS document into a coherent hierarchical structure. (Note, if there is any other structure that better suits your needs that is fine, but hierarchical structures are most prevalently used here.) Such a hierarchical structure can be presented to users to facilitate their comprehension and navigation of the digital content. It can further be applied to any purpose requiring an understanding of the structural relationship of the content files or parts of the content files. The organization may be specified to any level of granularity (intellectual and or physical) that is desired. Since the <structMap> element is repeatable, more than one organization can be applied to the digital content represented by the METS document.

The organization provided by the <structMap> may be purely intellectual or logical (such as a book divided into chapters), purely physical (a book divided into sequences of pages), or a mixture of logical and physical (a book sub-divided into chapters and subsequently divided into a sequence of pages). The content organized by the <structMap> may include many mixtures of digital content files: structured or unstructured text, image, audio, video and/or application (such as pdf).

In addition to the content represented by the files in the <fileSec> of the same METS documents, the <structMap> may also encompass and organize content represented by integral, external METS documents. Thus, the <structMap> of a METS document representing a digital version of a journal series might organize the multiple external METS documents representing the individual issues of the journal in the order of publication. The <structMap>s of the METS documents representing the individual issues might then organize their content.

In addition to providing a means for organizing content, the <structMap> provides a mechanism for linking content at any hierarchical level with relevant descriptive and administrative metadata. For more on this type of linking see the section on the element below.

The hierarchical structure specified by a <structMap> is encoded as a tree of nested elements. A element may directly point to content via child file pointer <fptr> elements (if the content is represented in the <fileSec>) or child METS pointer <mptr> elements (if the content is represented by an external METS document). The <fptr> element may point to a single whole <file> element that manifests its parent , or to part of a <file> that manifests its . It can also point to multiple files or parts of files that must be played/displayed either in sequence or in parallel to reveal its structural division. The , <mptr>, <fptr>, and other <structMap> elements that make this sophisticated structuring possible are described in detail below.

The example encodings in this <structMap> section show a variety of possible ways of structuring a digital version of the Martial *Epigrams*, some more plausible than others. The main intent throughout is not to present definitive encodings, but rather just to demonstrate the variety and flexibility of the structural mechanisms offered by METS. The best structural choices for a particular work depends on a variety of factors: the nature of the work being digitized, the anticipated users of the digital version, the kind or kinds of presentation desired, the capabilities of the available presentation programs, etc.

ATTRIBUTES OF THE STRUCTURAL MAP SECTION

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

TYPE (*string/O*): Identifies the type of structure represented by the <structMap>. For example, a <structMap> that represented a purely logical or intellectual structure could be assigned a TYPE value of "logical" whereas a <structMap> that represented a purely physical structure could be assigned a TYPE value of "physical". However, the METS schema neither defines nor requires a common vocabulary for this attribute. A METS profile, however, may well constrain the values for the <structMap> TYPE.

LABEL (*string/O*): Describes the <structMap> to viewers of the METS document. This would be useful primarily where more than one <structMap> is provided for a single object. A descriptive LABEL value, in that case, could clarify to users the purpose of each of the available <structMap>s.

ELEMENTS CONTAINED IN THE STRUCTURAL MAP SECTION

DIVISION

The structural divisions of the hierarchical organization provided by a <structMap> are represented by **division** elements, which can be nested to any depth. Each element can represent either an intellectual (logical) division or a physical division. It can explicitly identify the form of it represents via its TYPE attribute. Thus in the case of a digitized book subdivided by the <structMap> into nested elements representing chapters and then pages, the TYPE attribute values of the elements at each successive level of the hierarchy might be "book", "chapter", and "page".

The optional LABEL attribute value can identify a element in a specific manner suitable for presentation to the user of the digital object. So, a hierarchical presentation of the LABEL attribute values would typically form a kind of "table of contents" that digital library patrons could use to comprehend and navigate the content represented by a digital object encoded using METS. The LABEL attribute could, of course, serve different purposes in different applications of the METS standard.

A element at any level can be associated with one or more <dmdSec> elements by means of its DMDID attribute. It is assumed that any descriptive metadata referenced by a element pertains to the division as a whole. See the description of the DMDID attribute below. A element at any level can also be associated with administrative metadata contained in one or more rightsMD, techMD, sourceMD and/or digiprovMD elements. Typically this capability would be used to link the content represented by a division with the rights metadata that governs its use. For example: the root in a digital object encoded using METS that represents a video might point to a <rightsMD> element that expresses the copyright and access restriction information for the entire video. See the description of the ADMID below.

DIVISION – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

TYPE (*string/O*): An attribute that specifies the type of structural division that the element represents. Possible TYPE attribute values include: chapter, article, page, track, segment, section etc. METS places no constraints on the possible TYPE values. Suggestions for controlled vocabularies for TYPE may be found on the METS website.

LABEL (*string/O*): An attribute used, for example, to identify a to an end user viewing the document. Thus a hierarchical arrangement of the LABEL values could provide a table of contents to the digital content represented by a METS document and facilitate the users' navigation of the digital object. Note that a LABEL should be specific to its level in the structural map. In the case of a book with chapters, the book LABEL should have the book title and the chapter LABELs should have the individual chapter titles, rather than having the chapter LABELs combine both book title and chapter title. For clarification of the distinction between LABEL and ORDERLABEL see the description of the ORDERLABEL attribute.

DMDID (*IDREFS/O*): Contains the ID attribute values identifying the <dmdSec>, elements in the METS document that contain or link to descriptive metadata pertaining to the structural division represented by the current element. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

ADMID (*IDREFS/O*): Contains the ID attribute values identifying the <rightsMD>, <sourceMD>, <techMD> and/or <digiprovMD> elements within the <amdSec> of the METS document that contain or link to administrative metadata pertaining to the structural division represented by the element. Typically the ADMID attribute would be used to identify the <rightsMD> element or elements that pertain to the , but it could be used anytime there was a need to link a with pertinent administrative metadata. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

ORDER (*integer/O*): A representation of the s order among its siblings (e.g., its absolute, numeric sequence). For an example, and clarification of the distinction between ORDER and ORDERLABEL, see the description of the ORDERLABEL attribute below.

ORDERLABEL (*string/O*): A representation of the s order among its siblings (e.g., "xii"), or of any non-integer native numbering system. It is presumed that this value will still be machine actionable (e.g., it would support 'go to page ___' function), and it should not be used as a

replacement/substitute for the LABEL attribute. To understand the differences between ORDER, ORDERLABEL and LABEL, imagine a text with 10 roman numbered pages followed by 10 arabic numbered pages. Page iii would have an ORDER of "3", an ORDERLABEL of "iii" and a LABEL of "Page iii", while page 3 would have an ORDER of "13", an ORDERLABEL of "3" and a LABEL of "Page 3".

CONTENTIDS (*URI/O*): Content IDs for this division (equivalent to DIDL DII or Digital Item Identifier, a unique external ID).

xlink:label (*string/O*): An XLink label that can be referred to in the xlink:to and/or xlink:from attributes associated with <smlink> elements in the optional <structLink> section of a METS document. Provides the basis for the association of non-hierarchical elements.

DIVISION – EXAMPLE

The simple encoding fragment below demonstrates the div features described thus far, including the TYPE, LABEL, and DMDID attributes.

```
<?xml version="1.0" encoding="UTF-8"?>
<mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd
http://www.loc.gov/mods/v3 http://www.loc.gov/mods/v3/mods-3-1.xsd"
OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams">
<mets:dmdSec ID="DMD1">
       <mets:mdWrap MDTYPE="MODS">
              <mets:xmlData>
                     <mods:mods>
                            <mods:titleInfo>
                                   <mods:title>Martial Epigrams</mods:title>
                            </mods:titleInfo>
                     </mods:mods>
              </mets:xmlData>
       </mets:mdWrap>
</mets:dmdSec>
       ...
       <mets:structMap TYPE="physical">
              <mets:div TYPE="book" LABEL="Martial Epigrams II" DMDID="DMD1">
                     <mets:div TYPE="page" LABEL="Blank page"/>
                     <mets:div TYPE="page" LABEL="Page i: Series title page"/>
                     <mets:div TYPE="page" LABEL="Page ii: Blank page"/>
                     <mets:div TYPE="page" LABEL="Page iii: Title page"/>
                     <mets:div TYPE="page" LABEL="Page iv: Publication info"/>
                     <mets:div TYPE="page" LABEL="Page v: Table of contents"/>
                     <mets:div TYPE="page" LABEL="Page vi: Blank page"/>
                     <mets:div TYPE="page" LABEL="Page 1: Half title page"/>
                     <mets:div TYPE="page" LABEL="Page 2 (Latin)"/>
                     <mets:div TYPE="page" LABEL="Page 3 (English)"/>
                     <mets:div TYPE="page" LABEL="Page 4 (Latin)">
                     <mets:div TYPE="page" LABEL="Page 5 (English)"/>
                     <mets:div TYPE="page" LABEL="Page 6 (Latin)"/>
                     <mets:div TYPE="page" LABEL="Page 7 (English)"/>
              </mets:div>
       </mets:structMap>
</mets:mets>
```

Additional attributes associated with the element include ORDER, ORDERLABEL, CONTENTIDS, and xlink:label. Descriptions of all attributes supported by the element appear above.

Through its subsidiary elements, each element points to the digital content that manifests it. It can do so through one or more <mptr> element, if this content is represented by one or more external METS documents, or through one or more <fptr> element, if this content is represented by one or more <file> elements in the <fileSec>. In addition to or instead of directly pointing to digital content via its child

<fptr> and/or <mptr> elements, a element may itself contain elements that further subdivide the content represented by the division.

FILE POINTER

The <fptr> or **file pointer** element represents digital content that manifests its parent element. The content represented by an <fptr> element must consist of integral files or parts of files that are represented by <file> elements in the <fileSec>. Via its FILEID attribute, an <fptr> may point directly to a single integral <file> element that manifests a structural division. (See the section in Chapter 4 on internal linking above, and the description of the FILEID attribute in the attribute table for the <fptr> element below). However, an <fptr> element may also govern an <area> element, a <par> element, or a <seq> element which in turn would point to the relevant file or files. A child <area> element can point to part of a <file> that manifests a division, while the <par> and <seq> elements can point to multiple files or parts of files that together manifest a division. (For fuller information on the <area>, <par>, and <seq> elements see the dedicated sections below).

More than one <fptr> element can be associated with a element. Typically sibling <fptr> elements represent alternative versions, or manifestations, of the same content. For example, a page of a manuscript might be represented by a thumbnail image, a reference image, a master image, and a structured text version of the page content. Each of these versions would be represented by a <file> element in the <fileSec>. The element in the <structMap> corresponding to this page of the manuscript would therefore have four child <fptr> elements, each of which points to one of the alternative versions of the content. Typically sibling <fptr> elements represent alternative versions, or manifestations, of the same content. Additional attributes associated with the <fptr> element include ID and CONTENTIDS. Descriptions of all of the attributes associated with the <fptr> element appear in the table below.

FILE POINTER – ATTRIBUTES:

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

FILEID (*IDREF/O*): An optional attribute that provides the XML ID identifying the <file> element that links to and/or contains the digital content represented by the <fptr>. A <fptr> element should only have a FILEID attribute value if it does not have a child <area>, <par> or <seq> element. If it has a child element, then the responsibility for pointing to the relevant content falls to this child element or its descendants.

CONTENTIDS (*URI/O*): Content IDs for the content represented by the <fptr> (equivalent to DIDL DII or Digital Item Identifier, a unique external ID).

FILE POINTER – EXAMPLE

The following METS encoding fragment represents a case where the <structMap> as a whole represents a purely physical structure. The root division represents the whole book, and each structural division under this root represents a physical page. Each page division has three associated content files, each of which represents a different image manifestation (TIFF, JPEG, or GIF) of the same content:

>

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd
http://www.loc.gov/mods/v3 http://www.loc.gov/mods/v3/mods-3-1.xsd"
OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams II">
   <mets:fileSec>
       <mets:fileGrp USE="MASTER IMAGE">
           <mets:file ID="epi01m" MIMETYPE="image/tiff">
               <mets:FLocat xlink:href=
                "http://www.loc.gov/standards/mets/docgroup/full01.tif" LOCTYPE="URL"/>

           </mets:file>
           <mets:file ID="epi02m" MIMETYPE="image/tiff">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/full/02.tif" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi03m" MIMETYPE="image/tiff">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/full/03.tif" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi04m" MIMETYPE="image/tiff">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/full/04.tif" LOCTYPE="URL"/>
           </mets:file>
           ...
       </mets:fileGrp>
       <mets:fileGrp USE="REFERENCE IMAGE">
           <mets:file ID="epi01r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/jpg/01.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi02r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/jpg/02.jpg"
               LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi03r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/jpg/03.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi04r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=
           "http://www.loc.gov/standards/mets/docgroup/jpg/04.jpg" LOCTYPE="URL"/>
           </mets:file>
           ...
       </mets:fileGrp>
       <mets:fileGrp USE="THUMBNAIL IMAGE">
           <mets:file ID="epi01t" MIMETYPE="image/gif">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/gif/01.gif" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi02t" MIMETYPE="image/gif">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/gif/02.gif" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi03t" MIMETYPE="image/gif">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/gif/03.gif" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi04t" MIMETYPE="image/gif">
               <mets:FLocat xlink:href=
               "http://www.loc.gov/standards/mets/docgroup/gif/04.gif" LOCTYPE="URL"/>
           </mets:file>
           ...
       </mets:fileGrp>
   </mets:fileSec>
   <mets:structMap TYPE="physical">
       <mets:div TYPE="book" LABEL="Martial Epigrams II" DMDID="DMD1">
           <mets:div TYPE="page" LABEL="Blank page">
               <mets:fptr FILEID="epi01m"/>
```

```
            <mets:fptr FILEID="epi01r"/>
            <mets:fptr FILEID="epi01t"/>
        </mets:div>
        <mets:div TYPE="page" LABEL="Page i: Half title page">
            <mets:fptr FILEID="epi02m"/>
            <mets:fptr FILEID="epi02r"/>
            <mets:fptr FILEID="epi02t"/>
        </mets:div>
        <mets:div TYPE="page" LABEL="Page ii: Blank page">
            <mets:fptr FILEID="epi03m"/>
            <mets:fptr FILEID="epi03r"/>
            <mets:fptr FILEID="epi03t"/>
        </mets:div>
        <mets:div TYPE="page" LABEL="Page iii: Title page">
            <mets:fptr FILEID="epi04m"/>
            <mets:fptr FILEID="epi04r"/>
            <mets:fptr FILEID="epi04t"/>
        </mets:div>
        ...
    </mets:div>
  </mets:structMap>
</mets:mets>
```

METS POINTER

Like the <fptr> element, the **METS pointer** <mptr> element represents digital content that manifests its parent element. Unlike the <fptr>, which either directly or indirectly points to content represented in the <fileSec> of the parent METS document, the <mptr> element points to content represented by an external METS document. Thus, this element allows multiple discrete and separate METS documents to be organized at a higher level by a separate METS document. For example, METS documents representing the individual issues in the series of a journal could be grouped together and organized by a higher level METS document that represents the entire journal series. Each of the elements in the <structMap> of the METS document representing the journal series would point to a METS document representing an issue. It would do so via a child <mptr> element. Thus the <mptr> element gives METS users considerable flexibility in managing the depth of the <structMap> hierarchy of individual METS documents.

The <mptr> element points to an external METS document by means of an xlink:href attribute and associated XLink attributes as described in the section on external linking. (See Chapter 4). This is the same mechanism used for associating <file> elements with external content files in the FLocat element.

METS POINTER – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

LOCTYPE (*string/R*): Specifies the locator type used in the xlink:href attribute. Valid values for LOCTYPE are: *ARK, URN, URL, PURL, HANDLE*, *DOI*, or *OTHER*.

OTHERLOCTYPE (*string/O*): Specifies the type of locator used when the value OTHER is indicated in the LOCTYPE attribute. Although optional its use is strongly recommended.

CONTENTIDS (*URI/O*): The content ID for the content represented by the <mptr> type.

xlink:href (*URI/O*): This attribute gives the URI of where the METS document represented by the <mptr> is located. The xlink:href should always be present in this context if the <mptr> is to have any meaning or use.

xlink:role (*URI/O*): An attribute that serves a semantic purpose. If present, it specifies the URI of a resource that describes the role or function of the xlink:href link. This attribute is defined as part

of the xlink:simpleLink attribute group. It must be referenced as defined in IETF RFC 2396, except that, if the URI scheme used is allowed to have absolute and relative forms, the URI portion must be absolute.

xlink:arcrole (*URI/O*): An attribute that serves a semantic purpose. If present it specifies the URI of a resource that describes the pertinent arcrole. While more likely to be used in arcLinks than simpleLinks, this attribute is nonetheless defined as part of the xlink:simpleLink attribute group. This URI reference is defined in IETF-RFC-2396, except if the URI scheme used is allowed to have absolute and relative forms, the URI portion must be absolute.

xlink:title (*string/O*): An attribute that serves a semantic purpose. It is used to describe the meaning of a link or resource in a human readable fashion.

xlink:show (*string/O*): An attribute that specifies behavior within a simpleLink. It signals behavior intentions for traversal to the simpleLink's single remote ending resource. It must contain one of the following values: *new, replace, embed, other, none*.

xlink:actuate (*string/O*): An attribute that specifies behavior. Within a simpleLink it signals behavior intentions for traversal to the simpleLink's single remote ending resource. It must contain one of the following values: *onLoad, onRequest, other, or none*.

METS POINTER – EXAMPLE

The example below illustrates the application of the <mptr> element to the case of a book issued in two volumes, each of which is represented by a discrete METS document. Using the <mptr> element, the METS document below binds the two separate METS documents representing the individual volumes together into a single METS document representing the entire two-volume set.

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd
http://www.loc.gov/mods/v3 http://www.loc.gov/mods/v3/mods-3-1.xsd"
OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams I & II">
   <mets:dmdSec ID="DMD1">
       <mets:mdWrap MDTYPE="MODS">
           <mets:xmlData>
               <mods:mods>
                   <mods:titleInfo>
                       <mods:title>Epigrams / Martial ; with an English translation by
                        Walter C.A. Ker</mods:title>
                   </mods:titleInfo>
                   <mods:physicalDescription>
                       <mods:extent>2 v. ; 17 cm</mods:extent>
                       </mods:physicalDescription>
                   </mods:mods>
               </mets:xmlData>
           </mets:mdWrap>
       </mets:dmdSec>
   <mets:structMap TYPE="physical">
       <mets:div TYPE="multivolume book" LABEL="Martial Epigrams I & II" DMDID="DMD1">
           <mets:div TYPE="volume" LABEL="Volume I">
               <mets:mptr LOCTYPE="URL" xlink:href="http://www.loc.gov/standards/mets/
                documentation MatrialEpigrams.xml"/>
           </mets:div>
           <mets:div TYPE="volume" LABEL="Volume II">
               <mets:mptr LOCTYPE="URL" xlink:href="http://www.loc.gov/standards/mets/
                documentation/MatialEpigramsII.xml"/>
           </mets:div>
       </mets:div>
   </mets:structMap>
</mets:mets>
```

AREA

The **area** <area> element typically points to content consisting of just a portion or area of a file represented by a <file> element in the <fileSec>. In some contexts, however, the <area> element can also point to content represented by an integral file.

A single <area> element would appear as the direct child of a <fptr> element when only a portion of a <file>, rather than an integral <file>, manifested the digital content represented by the <fptr>. In this case the <area> element both identifies the pertinent <file> via its FILEID attribute and specifies the pertinent area of that file via its SHAPE and COORDS attributes (in the case of image content) or some combination of BETYPE, BEGIN, END, EXTTYPE and EXTENT attributes (in the case of text or audio /video content). These attributes are discussed below.

Multiple <area> elements would appear as the direct children of a <par> element or a <seq> element when multiple files or parts of files manifested the digital content represented by an <fptr> element. As described below, the <par> and <seq> elements are used to group multiple files or parts of files that must be played/displayed in parallel or in sequence to manifest the digital content represented by the parent <fptr> element. In these cases, each individual file, or file segment, would be represented by a child <area> element. When used as the direct child of an <fptr> element, as is described in the paragraph above, the <area> element typically points to just an area or segment of an integral file. When used in the context of a <par> or <seq> element, however, an area element can point either to an integral file or to a segment of a file as necessary.

AREA – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an

XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

FILEID (*IDREF/R*): An attribute which provides the XML ID value that identifies the <file> element in the <fileSec> that then points to and/or contains the digital content represented by the <area> element. It must contain an ID value represented in an ID attribute associated with a <file> element in the <fileSec> element in the same METS document.

SHAPE (*string/O*): An attribute that can be used as in HTML to define the shape of the relevant area within the content file pointed to by the <area> element. Typically this would be used with image content (still image or video frame) when only a portion of an integral image map pertains. If SHAPE is specified then COORDS must also be present (see below). SHAPE should be used in conjunction with COORDS in the manner defined for the shape and coords attributes on an HTML4 <area> element. SHAPE must contain one of the following values: *RECT, CIRCLE, POLY*.

COORDS (*string/O*): Specifies the coordinates in an image map for the shape of the pertinent area as specified in the SHAPE attribute. While technically optional, SHAPE and COORDS must both appear together to define the relevant area of image content. COORDS should be used in conjunction with SHAPE in the manner defined for the COORDs and SHAPE attributes on an HTML4 <area> element. COORDS must be a comma delimited string of integer value pairs representing coordinates (plus radius in the case of CIRCLE) within an image map. Number of coordinates pairs depends on shape: RECT: x1, y1, x2, y2; CIRC: x1, y1; POLY: x1, y1, x2, y2, x3, y3 . . .

BEGIN (*string/O*): An attribute that specifies the point in the content file where the relevant section of content begins. It can be used in conjunction with either the END attribute or the EXTENT attribute as a means of defining the relevant portion of the referenced file precisely. It can only be interpreted meaningfully in conjunction with the BETYPE or EXTTYPE, which specify the kind of beginning/ending point values or beginning/extent values that are being used. The BEGIN attribute can be used with or without a companion END or EXTENT element. In this case, the end of the content file is assumed to be the end point.

END (*string/O*): An attribute that specifies the point in the content file where the relevant section of content ends. It can only be interpreted meaningfully in conjunction with the BETYPE, which specifies the kind of ending point values being used. Typically the END attribute would only appear in conjunction with a BEGIN element.

BETYPE (*string/O*): An attribute that specifies the kind of BEGIN and/or END values that are being used. For example, if BYTE is specified, then the BEGIN and END point values represent the byte offsets into a file. If IDREF is specified, then the BEGIN element specifies the ID value that identifies the element in a structured text file where the relevant section of the file begins; and the END value (if present) would specify the ID value that identifies the element with which the relevant section of the file ends. Must be one of the following values*: BYTE, IDREF, SMIL, MIDI, SMPTE-25, SMPTE-24, SMPTE-DF30, SMPTE-NDF30, SMPTE-DF29.97, SMPTE-NDF29.97, TIME, TCF*.

EXTENT (*string/O*): An attribute that specifies the extent of the relevant section of the content file. Can only be interpreted meaningfully in conjunction with the EXTTYPE which specifies the kind of value that is being used. Typically the EXTENT attribute would only appear in conjunction with a BEGIN element and would not be used if the BEGIN point represents an IDREF.

EXTTYPE (*string/O*): An attribute that specifies the kind of EXTENT values that are being used. For example if BYTE is specified then EXTENT would represent a byte count. If TIME is specified the EXTENT would represent a duration of time. EXTTYPE must be one of the following values:

BYTE, SMIL, MIDI, SMPTE-25, SMPTE-24, SMPTE-DF30, SMPTE-NDF30, SMPTE-DF29.97, SMPTE-NDF29.97, TIME, TCF.

ADMID (*IDREFS/O*): Contains the ID attribute values identifying the <rightsMD>, <sourceMD>, <techMD> and/or <digiprovMD> elements within the <amdSec> of the METS document that contain or link to administrative metadata pertaining to the content represented by the <area> element. Typically the <area> ADMID attribute would be used to identify the <rightsMD> element or elements that pertain to the <area>; but it could be used anytime there is a need to link an <area> element with pertinent administrative metadata. For more information on using METS IDREFS and IDREF type attributes for internal linking, see Chapter 4.

CONTENTIDS (*URI/O*): Content IDs for the content represented by the <mptr> (equivalent to DIDL DII or Digital Item Identifier, a unique external ID).

AREA – EXAMPLE

The example below demonstrates the use of the <area> element to isolate particular areas of the image files that are referenced in the associated FILEID attributes. It shows both uses of the <area> element as a direct child of an <fptr> element and as a direct child of a <seq> element. In the former case, the specified area of the referenced image manifests the parent division by itself. In the latter case, the specified areas of two different images must be displayed in sequence to fully manifest the parent division.

```
<?xml version="1.0" encoding="UTF-8"?>
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd" OBJID="ark:/13030/kt9s2009hz" LABEL="Martial
Epigrams">
   <mets:fileSec>
       <mets:fileGrp USE="REFERENCE IMAGE">
           <mets:file ID="epi09r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                09.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi11r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                11.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi13r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpeg/
                13.jpg" LOCTYPE="URL"/>
           </mets:file>
       </mets:fileGrp>
   </mets:fileSec>
   <mets:structMap TYPE="logical">
       <mets:div TYPE="volume" LABEL="Martial Epigrams II">
           <mets:div TYPE="section" LABEL="Book VIII">
               <mets:div TYPE="introduction" LABEL="Introduction: Latin">
                   <mets:fptr>
                       <mets:seq>
                           <mets:area FILEID="epi09r" SHAPE="RECT"
                            COORDS="0,1150,2500,3150"/>
                           <mets:area FILEID="epi11r" SHAPE="RECT"
                               COORDS="0,600,2500,900"/>
                       </mets:seq>
                   </mets:fptr>
               </mets:div>
               <mets:div TYPE="epigram" LABEL="Epigram I: Latin">
                   <mets:fptr>
                       <mets:area FILEID="epi11r" SHAPE="RECT"
                       COORDS="0,1000,2500,1500"/>
                   </mets:fptr>
               </mets:div>
               <mets:div TYPE="epigram" LABEL="Epigram II: Latin">
                   <mets:fptr>
                       <mets:area FILEID="epi11r" SHAPE="RECT"
                       COORDS="0,1500,2500,2350"/>
                   </mets:fptr>
               </mets:div>
               <mets:div TYPE="epigram" LABEL="Epigram III: Latin">
                   <mets:fptr>
                       <mets:seq>
                           <mets:area FILEID="epi11r" SHAPE="RECT"
                           COORDS="0,2350,2500,3050"/>
                           <mets:area FILEID="epi13r" SHAPE="RECT"
                           COORDS="0,500,2500,2100"/>
                       </mets:seq>
                   </mets:fptr>
                   </mets:div>
               <mets:div TYPE="epigram" LABEL="Epigram IV: Latin">
                   <mets:fptr>
                       <mets:area FILEID="epi13r" SHAPE="RECT"
                       COORDS="0,2100,2500,2700"/>
                   </mets:fptr>
               </mets:div>
           </mets:div>
       </mets:div>
   </mets:structMap>
</mets:mets>
```

For further examples of how the <area> element can be used in the context of the <seq> and <par> elements, see the sections on these elements immediately below.

SEQUENCE OF FILES

The sequence of files <seq> element aggregates pointers to files, parts of files and/or parallel sets of files or parts of files that must be played or displayed sequentially to manifest a block of digital content. This might be the case, for example, if the parent element represented a logical division, such as a diary entry, that spanned multiple pages of a diary and, hence, multiple page image files. In this case, a <seq> element would aggregate multiple, sequentially arranged <area> elements, each of which pointed to one of the image files that must be presented sequentially to manifest the entire diary entry. If the diary entry started in the middle of a page, then the first <area> element (representing the page on which the diary entry starts) might be further qualified, via its SHAPE and COORDS attributes, to specify the specific, pertinent area of the associated image file.

SEQUENCE OF FILES – ATTRIBUTE

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

SEQUENCE OF FILES – EXAMPLE

The example below shows a case where a logical structuring of the digital content provided by the <structMap> is supported by the <seq> element. The structuring in this case is independent of the physical layout of the material in the analog source. The <structMap> here divides Book VIII of Martial's Epigrams into Latin and English versions, each of which is manifested by the sequences of files comprising the version.

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd
http://www.loc.gov/mods/v3 http://www.loc.gov/mods/v3/mods-3-1.xsd"
OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams">
   <mets:fileSec>
       <mets:fileGrp USE="REFERENCE IMAGE">
           <mets:file ID="epi09r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                09.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi10r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/pjg/
                10/jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi11r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                11.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi12r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                12.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi13r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href='http://www.loc.gov/standards/mets/docgroup/jpg/
                13.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi14r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                14.jpg" "LOCTYPE="URL"/>
           </mets:file>
           ...
       </mets:fileGrp>
   </mets:fileSec>
   <mets:structMap TYPE="logical">
       <mets:div TYPE="volume" LABEL="Martial Epigrams II">
           <mets:div TYPE="section" LABEL="Book VIII">
               <mets:div TYPE="subsection" LABEL="Latin version">
                   <mets:fptr>
                       <mets:seq>
                           <mets:area FILEID="epi09r"/>
                           <mets:area FILEID="epi11r"/>
                           <mets:area FILEID="epi13r"/>
                           ...
                       </mets:seq>
                   </mets:fptr>
               </mets:div>
               <mets:div TYPE="subsection" LABEL="English version">
                   <mets:fptr>
                       <mets:seq>
                           <mets:area FILEID="epi10r"/>
                           <mets:area FILEID="epi12r"/>
                           <mets:area FILEID="epi14r"/>
                           ...
                       </mets:seq>
                   </mets:fptr>
               </mets:div>
           </mets:div>
       </mets:div>
   </mets:structMap>
</mets:mets>
```

Multiple <seq> elements would appear under a <par> element when multiple sequences of files or parts of files must be played/displayed simultaneously to manifest the content of the governing <fptr> element. See the section on the <par> element below for a more complete description of this case.

PARALLEL FILES

The <par> or parallel files element aggregates pointers to files, parts of files, and/or sequences of files or parts of files that must be played or displayed simultaneously to manifest a block of digital content represented by an <fptr> element.

This might be the case, for example, with multi-media content, where a still image might have an accompanying audio track that comments on the still image. In this case, a <par> element would aggregate two <area> elements, one of which pointed to the image file and one of which pointed to the audio file that must be played in conjunction with the image. The <area> element associated with the image could be further qualified with SHAPE and COORDS attributes if only a portion of the image file was pertinent and the <area> element associated with the audio file could be further qualified with BETYPE, BEGIN, EXTTYPE, and EXTENT attributes if only a portion of the associated audio file should be played in conjunction with the image.

PARALLEL FILES – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

PARALLEL FILES – EXAMPLE 1

In the example below the <structMap> encoding uses the <par> element to recreate the experience and intent of the original analog source. In the source, a page of Latin text appears side by side with a page containing its English translation. The <par> elements here aggregate the images that represent the pairs of pages that must be displayed together to recreate this experience.

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd
http://www.loc.gov/mods/v3 http://www.loc.gov/mods/v3/mods-3-1.xsd"
OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams">
   <mets:fileSec>
       <mets:fileGrp USE="REFERENCE IMAGE">
           <mets:file ID="epi09r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                09/jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi10r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                10.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi11r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=http://www.loc.gov/standards/mets/docgroup/jpg/
                11.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi12r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                12.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi13r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                13.jpg" "LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi14r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href="http://www.loc.gov/standards/mets/docgroup/jpg/
                14.jpg" LOCTYPE="URL"/>
           </mets:file>
           ...
       </mets:fileGrp>
   </mets:fileSec>
   <mets:structMap TYPE="logical">
       <mets:div TYPE="volume" LABEL="Martial Epigrams II">
           <mets:div TYPE="section" LABEL="Book VIII">
               <mets:div TYPE="paired pages" LABEL="page 1: Latin & English">
                   <mets:fptr>
                       <mets:par>
                           <mets:area FILEID="epi09r"/>
                           <mets:area FILEID="epi10r"/>
                       </mets:par>
                   </mets:fptr>
               </mets:div>
               <mets:div TYPE="paired pages" LABEL="page 2: Latin & English">
                   <mets:fptr>
                       <mets:par>
                           <mets:area FILEID="epi11r"/>
                           <mets:area FILEID="epi12r"/>
                       </mets:par>
                   </mets:fptr>
               </mets:div>
               <mets:div TYPE="paired pages" LABEL="page 3: Latin & English">
                   <mets:fptr>
                       <mets:par>
                           <mets:area FILEID="epi13r"/>
                           <mets:area FILEID="epi14r"/>
                       </mets:par>
                   </mets:fptr>
               </mets:div>
               ...
           </mets:div>
       </mets:div>
   </mets:structMap>
</mets:mets>
```

A <par> element can also aggregate <seq> elements representing sequences of files or parts of files that must be played or displayed simultaneously to manifest the content represented by an <fptr>. This

might be the case when a single bytestream which should be played in parallel with other streams is too large to fit in a single file (e.g., very high quality multi-track audio, or video). In these cases, you would use subsidiary <seq> elements, where each sequence identified the files comprising a particular bytestream in the order they should be played back.

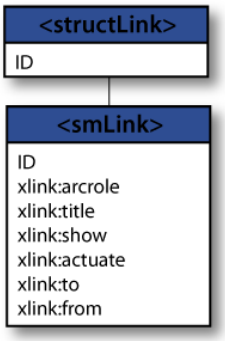
The two potential subsidiary units — <area> and <seq> — may not both be used directly under the same <par> element; a <par> must contain either a set of <area> elements or a set of <seq> elements. In the case where a <par> element aggregates <seq> elements, however, the <seq> elements themselves will aggregate the <area> elements that point to the pertinent files or parts of files.

The example below demonstrates a use of <seq> elements within a <par> element. In this case, the <structMap> provides for the parallel display of Latin and English versions of the material where the Latin and English versions appear on separate pages in the analog source, and in separate sets of image files in the digital version. Furthermore, the <structMap> arranges the digital version of the material into a logical structure in which the divisions are manifested by just portions of the referenced integral image files. But, in the case of two divisions, that for the "Introduction" and that for "Book VIII, Epigram III," the relevant portions of the material spans two image files. Therefore, the relevant areas of two image files must be displayed in sequence to manifest these divisions; and two different sequences must be displayed in parallel to manifest both Latin and English versions simultaneously.

PARALLEL FILES – EXAMPLE 2

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd" OBJID="ark:/13030/kt9s2009hz" LABEL="Martial
Epigrams">
   <mets:fileSec>
       <mets:fileGrp USE="REFERENCE IMAGE">
           <mets:file ID="epi09r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
                09.jpg” LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi10r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=”http://www.loc.gov/standards.mets/docgroup/jpg/
                10.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi11r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
                11.jpg” "LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi12r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
                12.jpg” LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi13r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
                13.jpg" LOCTYPE="URL"/>
           </mets:file>
           <mets:file ID="epi14r" MIMETYPE="image/jpeg">
               <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
                14.jpg” "LOCTYPE="URL"/>
           </mets:file>
       </mets:fileGrp>
   </mets:fileSec>
   <mets:structMap TYPE="logical">
       <mets:div TYPE="volume" LABEL="Martial Epigrams II">
           <mets:div TYPE="section" LABEL="Book VIII">
               <mets:div TYPE="epigram" LABEL="Introduction: Latin & English">
                   <mets:fptr>
                       <mets:par>
                           <mets:seq>
                               <mets:area FILEID="epi09r" SHAPE="RECT"
                                COORDS="0,1150,2500,3150"/>
                               <mets:area FILEID="epi11r" SHAPE="RECT"
                                COORDS="0,600,2500,900"/>
                           </mets:seq>
                           <mets:seq>
                               <mets:area FILEID="epi10r" SHAPE="RECT"
                                COORDS="0,1100,2500,3300"/>
                               <mets:area FILEID="epi12r" SHAPE="RECT"
                                COORDS="0,650,2500,950"/>
                           </mets:seq>
                       </mets:par>
                   </mets:fptr>
               </mets:div>
               <mets:div TYPE="epigram" LABEL="Epigram I: Latin & English">
                   <mets:fptr>
                       <mets:par>
                           <mets:area FILEID="epi11r" SHAPE="RECT"
                            COORDS="0,1000,2500,1500"/>
                           <mets:area FILEID="epi12r" SHAPE="RECT"
                            COORDS="0,950,2500,1600"/>
                       </mets:par>
                   </mets:fptr>
               </mets:div>
               <mets:div TYPE="epigram" LABEL="Epigram II: Latin & English">
                   <mets:fptr>
                       <mets:par>
                           <mets:area FILEID="epi11r" SHAPE="RECT"
                            COORDS="0,1500,2500,2350"/>
```

```
                        <mets:area FILEID="epi12r" SHAPE="RECT"
                         COORDS="0,1600,2500,2350"/>
                    </mets:par>
                </mets:fptr>
            </mets:div>
            <mets:div TYPE="epigram" LABEL="Epigram III: Latin & English">
                <mets:fptr>
                    <mets:par>
                        <mets:seq>
                            <mets:area FILEID="epi11r" SHAPE="RECT"
                             COORDS="0,2350,2500,3050"/>
                            <mets:area FILEID="epi13r" SHAPE="RECT"
                             COORDS="0,500,2500,2100"/>
                        </mets:seq>
                        <mets:seq>
                            <mets:area FILEID="epi12r" SHAPE="RECT"
                             COORDS="0,2350,2500,3050"/>
                            <mets:area FILEID="epi14r" SHAPE="RECT"
                             COORDS="0,600,2500,2100"/>
                        </mets:seq>
                    </mets:par>
                </mets:fptr>
            </mets:div>
            <mets:div TYPE="epigram" LABEL="Epigram IV: Latin & English">
                <mets:fptr>
                    <mets:par>
                        <mets:area FILEID="epi13r" SHAPE="RECT"
                         COORDS="0,2100,2500,2700"/>
                            <mets:area FILEID="epi14r" SHAPE="RECT"
                             COORDS="0,2100,2500,2700"/>
                    </mets:par>
                </mets:fptr>
            </mets:div>
        </mets:div>
    </mets:div>
  </mets:structMap>
</mets:mets
```



<STRUCTLINK> STRUCTURAL LINK SECTION

The **Structural Link Section** element <structLink> allows for the specification of hyperlinks between the different components of a METS structure that are delineated in a structural map. This element is a container for a single, repeatable element, <smLink> which indicates a hyperlink between two nodes in the structural map. The <structLink> section in the METS document is identified using its XML ID attributes.

STRUCTURAL LINK - ATTRIBUTE

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

ELEMENTS CONTAINED IN THE STRUCTURAL LINK SECTION

STRUCTURAL MAP LINK

The **Structural Map Link** element <smLink> identifies a hyperlink between two nodes in the structural map. You would use <smLink>, for instance, to note the existence of hypertext links between web pages, if you wished to record those links within METS. The <smLink> element uses nine attributes.

NOTE: <smLink> is an empty element. The location of the <smLink> element to which the <smLink> element is pointing MUST be stored in the xlink:href attribute.

STRUCTURAL MAP LINK – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

xlink:arcrole (*URI/O*): This attribute serves a semantic purpose. If present it specifies the URI of a resource that describes the pertinent arcrole. While it is more likely to be used in arcLinks than simpleLinks, this attribute is nonetheless defined as part of the xlink:simpleLink attribute group. It must be a URI reference as defined in IETF RFC 2396, except that, if the URI scheme used allows absolute and relative forms, the URI portion must be absolute.

xlink:title (*string/O*): This attribute serves a semantic purpose. It is used to describe the meaning of a link or resource in a human-readable fashion. This attribute is defined as part of the xlink:simpleLink attribute group.

xlink:show (*string/O*): Must contain one of the following values: *new, replace, embed, other, none*. This attribute specifies behavior. Within a simpleLink it signals behavior intentions for traversal to the simpleLink's single remote ending resource. xlink:show generally refers to whether a browser should show the resource in a new window or replace the current one, etc.

xlink:actuate (*string/O*): Must contain one of the following values: *onLoad, onRequest, other, none*. This optional XLink attribute specifies behavior. Within a simpleLink it signals behavior intentions for traversal to the simpleLink's single remote ending resource.

xlink:to (*string/O*): A required attribute that identifies the element that represents the target node of the link defined by the <smLink> element by referencing the element's xlink:label attribute value.

xlink:from (*string/O*): An attribute that identifies the element that represents the source node of the link defined by the <smLink> element by referencing the element's xlink:label attribute value.

STRUCTURAL LINKS SECTION – EXAMPLES

STRUCTRAL LINKS SECTION – EXAMPLE 1

In the following example, a METS document for a web page contains an image which is hyperlinked to another page. The <structMap> element might contain notation as follows for the two pages:

```
<mets:div ID="P1" TYPE="page" LABEL="Page 1">
   <mets:fptr FILEID="HTMLF1"/>
       <mets:div xlink:labelxlink:label="IMG1" TYPE="image" LABEL="Image Hyperlink to
Page 2">
           <mets:fptr FILEID="JPGF1"/> </div>
       </mets:div>
       <mets:div xlink:labelxlink:label="P2" TYPE="page" LABEL="Page 2">
           <mets:fptr FILEID=”HTMLF2”/>

       </mets:div>
```

If you wished to indicate that the image file in the contained with the first page is hyperlinked to the HTML file in the second page , you would have a <smLink> element within the <structLink> section of the METS document as follows:

```
<mets:structLink>
   <mets:smLink xlink:from="IMG1" xlink:to="P2" xlink:title="Hyperlink from JPEG Image on
    Page 1 to Page 2" xlink:show="new" xlink:actuate="onRequest"/>
</structLink>
```

STRUCTURAL LINKS SECTION – EXAMPLE 2

In a more complex example, a complete METS document describes a web site with particular pages selected for description within it using the <structLink> element to point to specific parts of the web site's structural map. In the following excerpt, a single page of the web site is illustrated including the <fileSec>, relevant portions of the <structMap>, and the <smLink> elements associated with that page.

Specifically, the "Projects" page (PAGE 1145) links to the following pages in the <structMap> of the web site:

*Officers (Link 36) to Page 113
*Calendar (Link 37) to Page 120

As the "Projects" page for the website, PAGE 1145 also has links to it from other pages in the web site, for example:

*Link 7
*Link 13

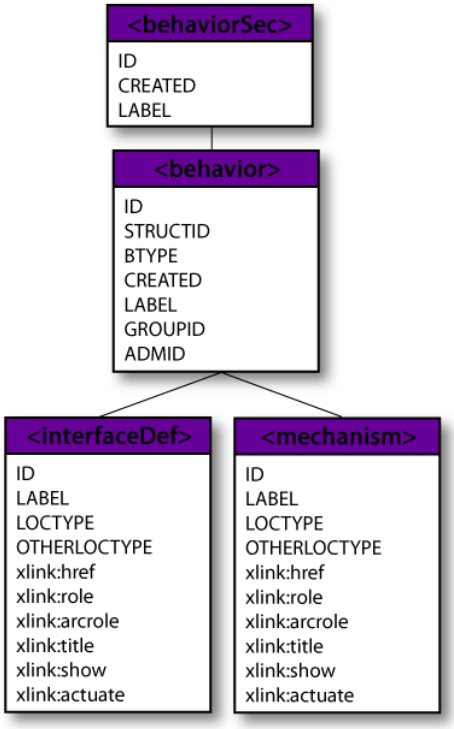
In another view,

From reference to Projects in Link 7, p. 113 to ->	Page 1145. Contains references to ->	Officers, Link 36, p. 113
From reference to Projects in Link 13, p. 120 to ->	Page 1145. Contains references to ->	Calendar, Link 37, p. 120

The following XML fragment illustrates how the linking might be done:

```
<mets:fileSec>
   <mets:fileGrp>
       <mets:file ID="FID1145" MIMETYPE="text/html">
           <mets:FLocat LOCTYPE="URL" xlink:href="dlibdev.nyu.edu/webarchive/metstest/
            www.apgawomen.org/projects.htm">
           </mets:FLocat>
       <mets:file>
...
<mets:structMap TYPE="logical">
...
<!-Within the <div> for page 113, LINK7 is described by the following <div> ->
   <mets:div DMDID="DM8" TYPE="web page" xlink:label="page113" LABEL="Officers page">
       <mets:fptr>
           <mets:par>
               <mets:area FILEID="FID113"></mets:area>
           </mets:par>
       </mets:fptr>
       <mets:div TYPE="hyperlink" xlink:label ="LINK7" LABEL="projects">
           <mets:fptr>
           <mets:area BEGIN="000" BETYPE="BYTE" END="111" FILEID="FID1145"></mets:area>
           </mets:fptr>
       </mets:div>
   </mets:div>
...
<!-Within the <div> for page 120, LINK13 is described by the following <div> ->
   <mets:div DMDID="DM8" TYPE="web page" xlink:label ="page120" LABEL="Calendar page">
       <mets:fptr>
           <mets:par>
               <mets:area FILEID="FID120"></mets:area>
           </mets:par>
       </mets:fptr>
       <mets:div TYPE="hyperlink" xlink:label ="LINK13" LABEL="projects">
           <mets:fptr>
               <mets:area BEGIN="000" BETYPE="BYTE" END="111" FILEID="FID1145">
               </mets:area>
           </mets:fptr>
       </mets:div>
   </mets:div>
<!-The following <div> represents Page 1145, the Projects page, and the
 pertinent <div>s for LINK36 and LINK37.  ->
   <mets:div DMDID="DM8" TYPE="web page" xlink:label ="page1145" LABEL=
   "http://dlibdev.nyu.edu/webarchive/metstest/www.apgawomen.org/projects.htm">
       <mets:fptr>
           <mets:par>
               <mets:area FILEID="FID1145">>/mets:area>
           </mets:par>
       </mets:fptr>
       <mets:div TYPE="hyperlink" xlink:label ="LINK36" LABEL="officers">
           <mets:fptr>
               <mets:area BEGIN="000" BETYPE="BYTE" END="111"
               FILEID="FID1145">>/mets:area>
           </mets:fptr>
       </mets:div>
       <mets:div TYPE="hyperlink" xlink:label ="LINK37" LABEL="calender">
           <mets:fptr>
               <mets:area BEGIN="000" BETYPE="BYTE" END="111"
               FILEID="FID1145">>/mets:area>
           </mets:fptr>
       </mets:div>
   </mets:div>
</mets:structMap>
<-The following <structLink> shows the pertinent references to and from page 1145.  >
   <mets:structLink>
       <mets:smLink xlink:from="LINK7" xlink:to="page1145"
        xlink:title="projects">
       </mets:smLink>
       <mets:smLink xlink:from="LINK13" xlink:to="page1145"
        xlink:title="projects">
       </mets:smLink>
       <mets:smLink xlink:from="LINK36" xlink:to="page113"
        xlink:title="officers">
```

```
    </METS:smLink>
    <mets:smLink xlink:from="LINK37" xlink:to="page120"
     xlink:title="calender">
    </METS:smLink>
</mets:structLink>
```



<BEHAVIORSEC> BEHAVIOR SECTION

METS provides a means to link digital content with applications or computer programming code that can be used in conjunction with the other information in the METS document to render or display the digital object, or to transform one or more of its component content files. Called "behaviors", such executable code may can be applied to any in the METS structMap (as specified by the STRUCTID attribute of a <behavior> element) or to any <transformFile> element in a <file> element in the <fileSec>.

A **behavior section** <behaviorSec> associates executable behaviors with content in the METS document by means of a repeatable behavior <behavior> element. This element has an interface definition <interfaceDef> element that represents an abstract definition of the set of behaviors represented by a particular behavior section. A <behavior> element also has a <mechanism> element which is used to point to a module of executable code that implements and runs the behavior defined by the interface definition.

The <behaviorSec> element, which is repeatable as well as nestable, can be used to group individual behaviors within the structure of the METS document. Such grouping can be useful for organizing families of behaviors together or to indicate other relationships between particular behaviors.

ATTRIBUTES OF THE BEHAVIOR SECTION

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

CREATED (*dateTime/O*): Specifies the date and time of creation for the <behaviorSec>.

LABEL (*string/O*): A text description of the behavior section.

ELEMENTS CONTAINED IN THE BEHAVIOR SECTION

BEHAVIOR (ELEMENT)

A **behavior** <behavior> element can be used to associate executable behaviors with content in the METS document. This element has an interface definition <interfaceDef> element that represents an abstract definition of a set of behaviors represented by a particular behavior. A <behavior> element also has a behavior mechanism <mechanism> element, a module of executable code that implements and runs the behavior defined abstractly by the interface definition.

BEHAVIOR (ELEMENT) – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. In the case of a <behavior> element that applies to a <transformFile> element, the ID value must be present and would be referenced from the transformFile/@TRANSFORMBEHAVIOR attribute. For more information on using ID attributes for internal and external linking see Chapter 4.

STRUCTID (*IDREFS/O*): An XML IDREFS attribute used to link a <behavior> to one or more elements within a <structMap> in the METS document. The content to which the STRUCTID points is considered input to the executable behavior mechanism defined for the behavior. If the <behavior> applies to one or more elements, then the STRUCTID attribute must be present.

BTYPE (*string/O*):. The behavior type provides a means of categorizing the related behavior.

CREATED (*dateTime/O*): The dateTime of creation for the behavior.

LABEL (*string/O*): A text description of the behavior.

GROUPID (*string/O*): An identifier that establishes a correspondence between the given behavior and other behaviors, typically used to facilitate versions of behaviors.

ADMID (*IDREFS/O*): Lists the XML ID values of administrative metadata sections within the METS document that pertain to the given behavior.

BEHAVIOR (ELEMENT) – EXAMPLE

```
<mets:behaviorSec>
      <mets:behavior ID="disp1" STRUCTID="top" BTYPE="display" LABEL="Display Behavior">
```

INTERFACE DEFINITION

The **interface definition** <interfaceDef> element contains a pointer to an abstract definition of a single behavior or a set of related behaviors that are associated with the content of a METS object. The interface definition object to which the <interfaceDef> element points using xlink:href could be another digital object, or some other entity, such as a text file which describes the interface or a Web Services Description Language (WSDL) file. Ideally, an interface definition object contains metadata that describes a set of behaviors or methods. It may also contain files that describe the intended usage of the behaviors, and possibly files that represent different expressions of the interface definition. The <interfaceDef> element is optional to allow for cases where an interface definition can be obtained directly from a behavior mechanism object. (see EXECUTABLE MECHANISM later in this section).

INTERFACE DEFINITION – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

LABEL (*string/O*): A text description of the interface definition section.

LOCTYPE (*string/R*): Specifies the locator type used in the xlink:href attribute. Valid values for LOCTYPE are: *ARK, URN, URL, PURL, HANDLE, DOI, OTHER.*

OTHERLOCTYPE (*string/O*): An attribute use to indicate an alternative LOCTYPE if the LOCTYPE attribute itself has a value of "OTHER".

xlink:href (*URI/O*): An attribute, technically optional, that gives the URI where the interface definition object represented by the <interfaceDef> can be located. While technically optional, the xlink:href should always be present in this context if the <interfaceDef> is to have any meaning or use. This attribute is defined as of the xlink:simpleLink attribute group.

xlink:role (*URI/O*): An optional XLink attribute that serves a semantic purpose. Must be a URI reference as defined in IETF RFC 2396, except that, if the URI scheme used is allowed to have absolute and relative forms, the URI portion must be absolute. If present, it specifies the URI of a resource that describes the role or function of the xlink:href link. This attribute is defined as part of the xlink:simpleLink attribute group.

xlink:arcrole (*URI/O*): Must be a URI reference as defined in IETF RFC 2396, except that, if the URI scheme used is allowed to have absolute and relative forms, the URI portion must be absolute. This is an optional XLink attribute that serves a semantic purpose. If present, it specifies the URI of a resource that describes the pertinent arcrole. While more likely to be used in arcLinks than simpleLinks, this attribute is nonetheless defined as part of the xlink:simpleLink attribute group.

xlink:title (*string/O*): This attribute serves a semantic purpose. It is used to describe the meaning of a link or resource in a human-readable fashion. This attribute is defined as part of the xlink:simpleLink attribute group.

xlink:show (*string/O*): Must contain one of the following values: *new, replace, embed, other, none.* This optional XLink attribute specifies a behavior. Within a simpleLink, it signals behavior intentions for traversal to the simpleLink's single remote ending resource.

xlink:actuate (*string/O*): Must contain one of the following values: *onLoad, onRequest, other, none*. This optional XLink attribute specifies behavior. Within a simpleLink, it signals behavior intentions for traversal to the simpleLink's single remote ending resource.

INTERFACE DEFINITION – EXAMPLE

```
<mets:behaviorSec>
   <mets:behavior ID="disp1" STRUCTID="top" BTYPE="display" LABEL= "Display Behavior">
       <mets:interfaceDef LABEL="EAD Display Definition" LOCTYPE="URL"
        xlink:href="http://texts.cdlib.org/dynaxml/profiles/display/oacDisplayDef.txt"/>
```

EXECUTABLE MECHANISM

A **mechanism** element <mechanism> contains a pointer to an executable code module that implements a set of behaviors defined by an interface definition. The <mechanism> element will be a pointer to another object (a mechanism object). A mechanism object could be another METS object, or some other entity (e.g., a WSDL file). A mechanism object should contain executable code, pointers to executable code, or specifications for binding to network services (e.g., web services).

EXECUTABLE MECHANISM – ATTRIBUTES

ID (*ID/O*): This attribute uniquely identifies the element within the METS document, and allows the element to be referenced unambiguously from another element or document via an IDREF or an XPTR. For more information on using ID attributes for internal and external linking see Chapter 4.

LABEL (*sting/O*): A text description of the mechanism section.

LOCTYPE (*string/R*): The type of locator contained in the <mechanism> element. Must be one of the following: *ARK, URN, URL, PURL, HANDLE, DOI, OTHER.*

OTHERLOCTYPE (*string/O*): An attribute used to indicate an alternative LOCTYPE if the LOCTYPE attribute itself has a value of "OTHER".

xlink:href (*URI/O*): An attribute that gives the URI where the mechanism object represented by the <mechanism> element can be located. While technically optional, the xlink:href should always be present in this context if the <mechanism> is to have any meaning or use.

xlink:role (URI/O): An optional XLink attribute that serves a semantic purpose. Must be a URI reference as defined in IETF RFC 2396 except that, if the URI scheme used is allowed to have absolute and relative forms, the URI portion must be absolute. This optional XLink attribute serves a semantic purpose. If present, it specifies the URI of a resource that describes the role or function of the xlink:href link. This attribute is defined as part of the xlink:simpleLink attribute group.

xlink:arcrole (*URI/O*): Must be a URI reference as defined in IETF RFC 2396, except that, if the URI scheme used is allowed to have absolute and relative forms, the URI portion must be absolute. This optional XLink attribute serves a semantic purpose. If present, it specifies the URI of a resource that describes the pertinent arcrole. While more likely to be used in arcLinks than simpleLinks, this attribute is nonetheless defined as part of the xlink:simpleLink attribute group.

xlink:title (*string/O*): An attribute that serves a semantic purpose. It is used to describe the meaning of a link or resource in a human-readable fashion. This attribute is defined as part of the xlink:simpleLink attribute group.

xlink:show (*string/O*): Must contain one of the following values: *new, replace, embed, other, none*. This optional XLink attribute specifies a behavior. Within a simpleLink, it signals behavior intentions for traversal to the simpleLink's single remote ending resource.

xlink:actuate (*string/O*): Must contain one of the following values: *on Load, onRequest, other, none*. This attribute specifies behavior. Within a simpleLink, it signals behavior intentions for traversal to the simpleLink's single remote ending resource.

NOTE: <mechanism> is an empty element. The location of the mechanism object to which the <mechanism> element is pointing MUST be stored in the xlink:href attribute.

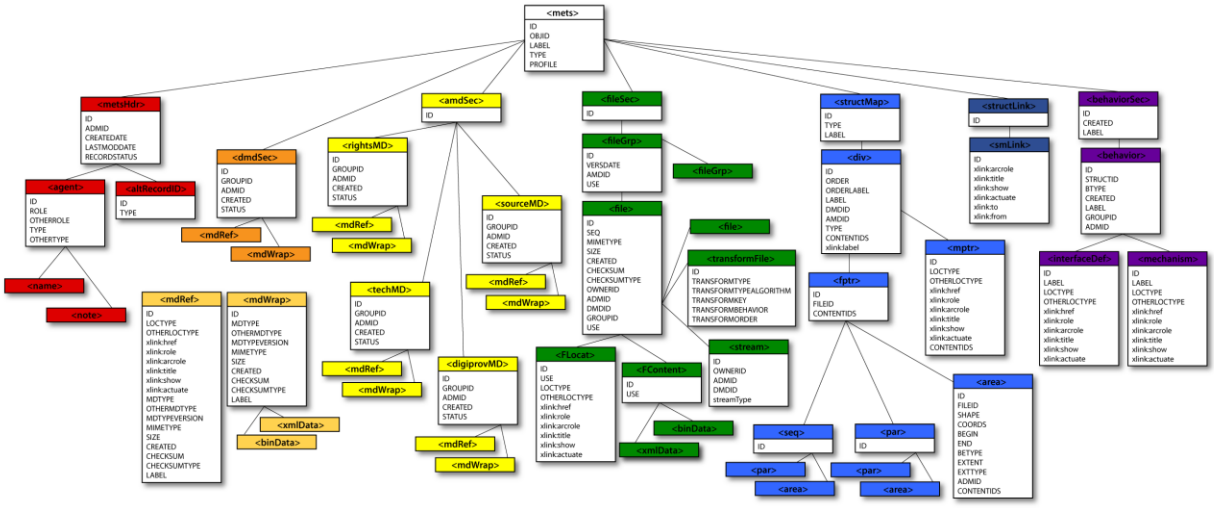
EXECUTABLE MECHANISM – EXAMPLE

```
<mets:behaviorSec>
   <mets:behavior ID="disp1" STRUCTID="top" BTYPE="display" LABEL="Display Behavior">
       <mets:interfaceDef LABEL="EAD Display Definition" LOCTYPE="URL" xlink:href=
        ”http://texts.cdlib.org/dynaxml/profiles/display/oacDisplayDef.txt”/>
       <mets:mechanism LABEL="EAD Display Mechanism" LOCTYPE="URL" xlink:href=
        “http://texts.cdlib.org/dynaxml/profiles/display/oacDisplayMech.xml
   </mets:behavior>
</mets:behaviorSec>
```

BEHAVIOR SECTION – EXAMPLE

The following example illustrates how a METS object will call executable code to 1) display an Encoded Archival Description (EAD) finding aid, and 2) authenticate public access to the finding aid. Pertinent sections of the <structMap> are included in the example.

```
<mets:mets schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd  http://www.loc.gov/mods/v3
http://www.loc.gov/standards/mods/v3/mods-3-0.xsd  http://www.loc.gov/mix/
http://www.loc.gov/standards/mix/mix.xsd  http://sunsite.berkeley.edu/MOA2/
http://sunsite.berkeley.edu/METS/moa2md.xsd" OBJID="ark:/13030/hb1d5n9804" TYPE="text"
PROFILE="http://sunsite.berkeley.edu/mets/profiles/UCBTextProfile.xml" LABEL="George E.
Link, History of the Kaiser Permanente Medical Care Program">
...
   <mets:structMap>
       <mets:div ID=”top” TYPE="TEI.2" LABEL="George E. Link History of the Kaiser
Permanente
        Medical Care Program: Kaiser Permanente Medical Care Program Oral History
        Project">
          <mets:fptr FILEID="KAISER1"/>
   </mets:structMap>
   …
   <mets:behaviorSec>
       <mets:behavior ID="disp1" STRUCTID="top" BTYPE="display" LABEL="Display Behavior">
          <mets:interfaceDef LABEL="EAD Display Definition" LOCTYPE=”URL” xlink:href=
           ”http://texts.cdlib.org/dynaxml/profiles/display/oacDispalyDef.txt”/
          <mets:mechanism LABEL="EAD Display Mechanism" LOCTYPE="URL"xlink:href=
           “http://texts.cdlib.org/dymaxml/profiles/display/oacDisplaymech.xml"/>
       </mets:behavior>
       ...
       <mets:behavior ID="auth1" STRUCTID="top" BTYPE="authentication" LABEL=
        "AuthenticationBehavior">
          <mets:interfaceDef LABEL="General Public Authentication Definition "LOCTYPE=
           "URL" xlink:href=:http://texts.cdlib.org/dynaxml/profiles/display/
           publicAuthdef.txt”/>
             <mets:mechanism LABEL="General Public Authentication Mechanism" LOCTYPE=
              "URL" xlink:href=”http://texts.cdlib.org/dynaxml/profiles/authentication/
              publicAuthMech.xml”/>
       </mets:behavior>
   </mets:behaviorSec>
</mets:mets>
```



CHAPTER 4: COMMON CONSTRUCTS AND STANDARDS

XML Technologies and Specifications used throughout METS

XSD ID, IDREF, AND IDREFS

METS uses IDREF and IDREFS attributes on numerous elements to establish links between these elements and other elements within the METS document. In addition, METS uses IDREF mechanisms to establish links between an <area> element within the METS structMap and elements in a structured text content file.

INTERNAL CROSS REFERENCING IN METS VIA ID, IDREF AND IDREFS.

OVERVIEW OF ID, IDREF AND IDREFS DATATYPES FOR XML ATTRIBUTES.

THE XSD ID DATATYPE

XML schema provides a built in ID datatype for the purpose of associating internally unique identifiers with elements in an XML instance document. Note that an attribute implementing the XML schema ID datatype is ONLY intended to provide a means of assigning a unique identifier to the element with which it is associated. Attributes of this type are NOT intended to store any kind of external identifier. The following characteristics apply to attributes implementing the XSD ID datatype.

- An XML schema or DTD can declare one and only one attribute of type ID in conjunction with each element declared by the schema.
- Values assigned to attributes of the ID type in an instance document must begin with a letter or underscore (not a digit), and can only contain letters, digits, periods, hyphens and underscores.
- Values assigned to attributes of the ID type in an instance document must be unique within the document and across elements from all the namespaces represented in the document.

THE XSD IDREF AND IDREFS DATATYPES

XML schema provides two built in datatypes for creating cross references from one element in an instance document to another element or elements in the same document. An attribute of type IDREF associated with an element can cite the ID value that identifies another element in the same instance

document. In other words, an attribute of type IDREF creates a cross reference from the source element with which it's associated to another element in the same instance document by citing the ID value that identifies the target element. An attribute of type IDREFS works in the same manner, but can contain multiple space delimited ID values, each of which identifies a different element in the same instance document. So an attribute of type IDREFS creates cross references from the source element with which it is associated to multiple other elements in the same instance document by citing the ID values that identify the target elements. The concrete examples of the application of IDREF and IDREFS attributes in METS that appear in the section immediately below should help clarify the IDREF/ID cross referencing mechanisms.

CROSS-REFERENCING IN METS

METS makes extensive provisions for using attributes of the ID, IDREF and IDREFS datatypes to create cross references between related elements. Ultimately these provisions allow units of information appearing in dispersed locations across a METS instance to be linked to all of their appropriate contexts without redundancy. METS elements of the mdSecType and fileType datatypes have required ID attributes which allow the descriptive metadata, administrative metadata, and content file elements that implement these datatypes to be referenced from the other parts of the METS instance document to which they pertain. In addition to this, elements in the <structMap> map can include ID attribute values that allow them to be referenced by <behavior> elements in the <behaviorSec>. METS' specific cross referencing provisions for different contexts follow.

CONTEXT 1: <DMDSEC>: DESCRIPTIVE METADATA

- A unique ID attribute value must identify each <dmdSec> element in a METS instance document.
- Each of the following elements can reference one or more specific <dmdSec> elements by citing their ID values in its DMDID attribute. (The DMDID attribute is of IDREFS type):
    - mets/fileSec/fileGrp/file
    - mets/fileSec/file/stream
    - mets/structMap/div

- Example. In the example below the ID attribute value of "DMD1" identifies the single <dmdSec> element. The root in the <structMap> references this <dmdSec> by means of its DMDID attribute. Thus the encoding indicates that the descriptive metadata in the <dmdSec> identified by the ID value "DMD1" applies to the entire content as represented by the root in the <structMap>.

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/"
xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd http://www.loc.gov/mods/v3
http://www.loc.gov/mods/v3/mods-3-1.xsd"
OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams">
    <mets:dmdSec ID="DMD1">
        <mets:mdWrap MDTYPE="MODS">
            <mets:xmlData>
                <mods:mods>
                    <mods:titleInfo>
                        <mods:title>Martial Epigrams</mods:title>
                    </mods:titleInfo>
                </mods:mods>
            </mets:xmlData>
        </mets:mdWrap>
    </mets:dmdSec>
    <mets:structMap TYPE="physical">
        <mets:div TYPE="book" LABEL="Martial Epigrams II" DMDID="DMD1">
        </mets:div>
    </mets:structMap>
</mets:mets>
```

CONTEXT 2: <TECHMD>, <RIGHTSMD>, <SOURCEMD>, <DIGIPROVMD>:

ADMINISTRATIVE METADATA.

- A unique ID attribute value must identify each administrative metadata element in a METS instance document—specifically, each techMD, sourceMD, rightsMD or digiprovMD element.
- Each of the following elements can reference one or more specific <techMD>, <sourceMD>, <rightsMD> and/or <digiprovMD> elements containing pertinent administrative metadata by citing their ID values in its ADMID attribute. (The ADMID attribute, like the DMDID attribute is of type IDREFS).
    - mets/dmdSec
    - mets/amdSec/techMD
    - mets/amdSec/sourceMD
    - mets/amdSec/rightsMD
    - mets/amdSec/digiprovMD
    - mets/fileSec/fileGrp
    - mets/fileSec/fileGrp/file
    - mets/fileSec/fileGrp/file/stream
    - mets/behaviorSec/behavior
- Example. In the example below the ID attribute value of “App4ADM1” identifies the single <techMD> element and the ID value “App4ADM2” identifies the single <rightsMD> element. The ADMID attribute on the single <file> element in the <fileSec> references both of these ID values (“App4ADM1 App4ADM2”). Thus the encoding indicates that both the technical metadata in the <techMD> element identified by the ID value “App4ADM1” and the rights metadata in the <rightsMD> element identified by the ID value “App4ADM2” apply to the content file represented by the <file> element.

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/"
xmlns:mods="http://www.loc.gov/mods/v3"
xmlns:rts="http://cosimo.stanford.edu/sdr/metsrights/"
xmlns:mix="http://www.loc.gov/mix/"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd
http://cosimo.stanford.edu/sdr/metsrights/
http://cosimo.stanford.edu/sdr/metsrights.xsd
http://www.loc.gov/mods/v3
http://www.loc.gov/standards/mods/v3/mods-3-1.xsd
```

```
http://www.loc.gov/mix/
http://www.loc.gov/standards/mix/mix.xsd"
OBJID="ark:/13030/hb3c6005tv"
TYPE="still image"
LABEL="S. P. [Simmon Peña] Storms, Interpreter [&amp;amp;c], Indian agency - near Grass
Valley, California, 1851"
PROFILE="http://www.loc.gov/standards/mets/profiles/0000000X.xml">
 <mets:amdSec>
     <mets:techMD ID="App4ADM1">
         <mets:mdWrap MDTYPE="NISOIMG">
             <mets:xmlData>
                 <mix:mix>
                     <mix:BasicImageParameters>
                         <mix:Format>
                             <mix:MIMEType>image/tiff</mix:MIMEType>
                             <mix:Compression>
                             <mix:CompressionScheme>1</mix:CompressionScheme>
                             </mix:Compression>
                             <mix:PhotometricInterpretation>
                                 <mix:ColorSpace>2</mix:ColorSpace>
                                 <mix:ICCProfile>
                                 <mix:ProfileName>DilE836G18_01</mix:ProfileName>
                                 </mix:ICCProfile>
                             </mix:PhotometricInterpretation>
                         </mix:Format>
                     </mix:BasicImageParameters>
                     <mix:ImageCreation>
                         <mix:ImageProducer>DIL/U.C. Berkeley Library
                         </mix:ImageProducer>
                         <mix:DeviceSource>reflection print scanner
                         </mix:DeviceSource>
                         <mix:ScanningSystemCapture>
                             <mix:ScanningSystemHardware>
                                 <mix:ScannerManufacturer>Epson
                                 </mix:ScannerManufacturer>
                                 <mix:ScannerModel>
                                     <mix:ScannerModelName>836xl
                                     </mix:ScannerModelName>
                                     <mix:ScannerModelSerialNo>B05401003MG9601009
                                     </mix:ScannerModelSerialNo>
                                 </mix:ScannerModel>
                             </mix:ScanningSystemHardware>
                         </mix:ScanningSystemCapture>
                     </mix:ImageCreation>
                     <mix:ImagingPerformanceAssessment>
                         <mix:SpatialMetrics>
                             <mix:SamplingFrequencyUnit>2</mix:SamplingFrequencyUnit>
                             <mix:XSamplingFrequency>600</mix:XSamplingFrequency>
                             <mix:YSamplingFrequency>600</mix:YSamplingFrequency>
                         </mix:SpatialMetrics>
                         <mix:Energetics>
                             <mix:BitsPerSample>8,8,8</mix:BitsPerSample>
                             <mix:SamplesPerPixel>3</mix:SamplesPerPixel>
                         </mix:Energetics>
                     </mix:ImagingPerformanceAssessment>
                 </mix:mix>
             </mets:xmlData>
         </mets:mdWrap>
     </mets:techMD>
     <mets:rightsMD ID="App4ADM2">
         <mets:mdWrap MDTYPE="OTHER" OTHERMDTYPE="METSRights">
             <mets:xmlData>
                 <rts:RightsDeclarationMD RIGHTSCATEGORY="OTHER"
                  OTHERCATEGORYTYPE="UNKNOWN">
                     <rts:RightsHolder>
                         <rts:RightsHolderComments>All requests to reproduce,
                          publish, quote from, or otherwise use collection materials
                       must be submitted in writing to the Head of Access
                           Services, The Bancroft Library, University of California,
                           Berkeley 94720-6000. Consent is given on behalf of The
                           Bancroft Library as the owner of the physical items and
```

```
                    does not constitute permission from the copyright owner.
                    Such permission must be obtained from the copyright owner.
                    See: http:// bancroft.berkeley.edu/reference/
                    permissions.html
                   </rts:RightsHolderComments>
               </rts:RightsHolder>
           <rts:Context CONTEXTCLASS="GENERAL PUBLIC">
               <rts:Constraints>
                   <rts:ConstraintDescription>Copyright status unknown. Some
                    materials in these collections may be protected by the
                    U.S. Copyright Law (Title 17, U.X.C.). In addition, the
                    reproduction of some materials may be restricted by terms
                    of University of California gift or purchase agreements,
                    donor restrictions, privacy and publicity rights,
                    licensing and trademarks. Transmission or reproduction of
                    materials protected by copyright beyond that allowed by
                    fair use requires the written permission of copyright
                    owners.  Works not in the public domain cannot be
                    commercially exploited without permission of the copyright
                    owner. Responsibility for any use rests exclusively with
                    the user.
               </rts:ConstraintDescription>
               </rts:Constraints>
           </rts:Context>
       </rts:RightsDeclarationMD>
       </mets:xmlData>
   </mets:mdWrap>
</mets:rightsMD>
</mets:amdSec>
<mets:fileSec>
   <mets:fileGrp VERSDATE="2003-01-22T00:00:00.0" USE="archive image">
       <mets:file ID="App4FID1" MIMETYPE="image/tiff" SEQ="1"
        CREATED="2003-01-22T00:00:00.0" ADMID="App4ADM1 App4ADM2"
        GROUPID="GID1">
          <mets:FLocat xlink:href="http://offlineimage/calcultures/ucb/
           cubanc_1_2_00004722a.tif" LOCTYPE="URL"/>
       </mets:file>
   </mets:fileGrp>
</mets:fileSec>
<mets:structMap TYPE="physical">
   <mets:div ORDER="1" TYPE="still image" LABEL="S. P. [Simmon Peña]
    Storms, Interpreter [&#x26;c], Indian agency - near Grass Valley,
    California, 1851">
       <mets:fptr FILEID="App4FID1"/>
   </mets:div>
</mets:structMap>
</mets:mets>
```

CONTEXT 3: <FILE>: CONTENT FILES

- A unique ID attribute value must identify each <file> element in the <fileSec> of a METS document.
- Each of the following elements can reference the specific <file> pertinent to it by citing the <file> element's ID value in its FILEID attribute. (The FILEID attribute is of type IDREF).
    - mets/structMap/div/fptr
    - mets/structMap/div/fptr/area
    - mets/structMap/div/fptr/seq/area
    - mets/structMap/div/fptr/par/area
    - mets/structMap/div/fptr/par/seq/area
- Example. The example under "CONTEXT2" immediately above also demonstrates the current context. In this example, the ID attribute value of "App4FID1" identifies the single <file> element. The single <fptr> element under the root of the <structMap> references

this ID value. Thus the encoding indicates that the content file represented by the <file> element with an ID value of "App4FID1" manifests the root element.

CONTEXT 4: <DIV>: NODES OF THE <STRUCTMAP>

- A unique ID attribute value must identify each in the <structMap> for which there is an associated <behavior> in the <behaviorSec>. (However, note that the ID attribute is not generally required for elements)
- Each <behavior> in the <behaviorSec> must include a STRUCTID attribute which cites the ID values of the elements to which the defined behavior applies. (The STRUCTID attribute is of type IDREFS).
- In the full example of the Behavior Section found in Chapter 3 above, the STRUCTID attributes on the two <behavior> elements appearing in the <behaviorSec> identify the content to which the behaviors represented should be applied – the content represented by the with the ID attribute value of "top." The <behaviorSec> in the example indicated that both the "disp1" and "auth1" behavior mechanisms should operate when the element identified by the ID value "top" is activated, for example, in a METS reader/navigator.

EXTERNAL REFERENCING USING IDREF/ID LINKS

PROVISIONS FOR REFERENCING SPECIFIC ELEMENTS IN EXTERNAL, STRUCTURED TEXT CONTENT AND METADATA FILES FROM METS BY MEANS OF ID ATTRIBUTE VALUES DECLARED IN THESE EXTERNAL FILES

Several structured text languages—such as XML, SGML, and HTML—allow identifiers to be associated with individual elements by means of attributes that implement the XML ID datatype. This has already been described above with respect to XML in general and METS in particular. METS makes two provisions for referencing specific elements in external, structured text document.

USE OF BEGIN, END, AND BETYPE TO REFERENCE IDS IN STRUCTURED TEXT CONTENT FILES.

Through its descendant <fptr>, <area>, <par> and <seq> elements, a in the <structMap> can point to the <file> element or elements in the <fileSec> representing the content that manifests the . Sometimes, however, only a portion of the integral content represented by the referenced <file> element is pertinent. If the content represented by the <file> element is encoded in XML, SGML, or HTML and the key elements of the content file have associated ID attribute values, a METS <area> element can use these ID values to isolate the relevant portion of the content file. In this case, the <area> BEGIN attribute would cite the ID attribute value of the first pertinent element in the indicated content file; the <area> END attribute would cite the ID value of the last pertinent element in the indicated content file; and the BETYPE attribute value would be "IDREF" to indicate that ID values were being used to identify the bounding elements defining the the relevant section of the content file.

EXAMPLE

In the example below, which is an excerpt from a longer encoding, the second element in the <structMap> uses the <area> element's BEGIN, END and BETYPE attributes to isolate just the relevant portion of a TEI content file that manifests the . The represents a single, dated entry in the diary; and the <area> element associates this with just the portion of the integral TEI encoding that

begins with the TEI element identified by the ID attribute value "entry1" and ends with the TEI element identified by the ID attribute value "entry1end."

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods="http://www.loc.gov/mods/"
xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation="http://www.loc.gov/METS/
http://www.loc.gov/standards/mets/mets.xsd" OBJID="ark:/13030/kt9s2010hz" TYPE="text"
LABEL="[Patrick Breen Diary November 20, 1846 - March 1, 1847]"
PROFILE="http://www.loc.gov/mets/profiles/00000005.xml">
   <mets:dmdSec ID="DMD1">
       <mets:mdRef  LABEL="Patrick Breen Papers" xlink:href="http:/sunsite2.berkeley.edu/
        cgi-bin/oac/calher/breenpapers" LOCTYPE="URL" MDTYPE="EAD" XPTR="xpointer
        (id('xyzj0098'))"/>
   </mets:dmdSec>
   <mets:fileSec>
       <mets:fileGrp VERSDATE="1998-12-04T00:00:00" USE="text/tei">
           <mets:file ID="FID1" MIMETYPE="text/sgml" SEQ="1"
            CREATED="1998-12-04T00:00:00" GROUPID="GID1">
              <mets:FLocat xlink:href="http://sunsite.berkeley.edu/~jmcdonou/BREEN/sgml/
               breen2.sgm" LOCTYPE="URL"/>
           </mets:file>
       </mets:fileGrp>
   </mets:fileSec>
   <mets:structMap TYPE="logical">
       <mets:div LABEL="Patrick Breen Diary: Donner passage" DMDID="DMD1">
           <mets:div TYPE="entry" LABEL="Friday Nov. 20th 1846">
               <mets:fptr>
                   <mets:area FILEID="FID1" BETYPE="IDREF" BEGIN="entry1"
                    END="entry1end"/>
               </mets:fptr>
           </mets:div>
       </mets:div>
   </mets:structMap>
</mets:mets>
```

ID VALUES IN THE <MDREF> "XPTR" ATTRIBUTE.

The <mdRef> element, which can appear within <dmdSec>, <techMD>, <rightsMD>, <sourceMD> and <digiprovMD> elements, points to descriptive or administrative metadata in external files. In the cases where this metadata is in XML or SGML format, and only a portion of the entire metadata file is relevant, the <dmdSec> element's XPTR attribute can be used in conjunction with the ID attribute value that identifies the pertinent element in the external metadata file to isolate the relevant section of that file. For example, if the relevant element in the referenced metadata file had an ID value of "xyzj0098", the <mdRef> element in the METS instance document could reference this specific element with the following XPTR value: XPTR="xpointer(id('xyzj0098'))"

EXAMPLE.

The example immediately above demonstrates the use of an XPTR attribute in an <mdRef> element. Here, the <mdRef> points to the finding aid for a collection ("Patrick Breen Papers") that includes the source document represented by the METS encoding ("Patrick Breen Diary"). The XPTR attribute on the <mdRef> indicates that the portion of the finding aid describing the diary is contained in the finding aid element identified by the ID attribute value "xyzj0098".

REFERENCING METS ELEMENTS FROM EXTERNAL DOCUMENTS

Each element defined in the METS schema for use in a METS instance document has an associated ID attribute. In general, except for the few cases noted above, this ID attribute is optional. However, an ID attribute value can be assigned to identify any METS element in an instance document any time it might be necessary to provide a handle to which this element can be referred to unambiguously from outside the METS document. The implementers of the METS schema did not attempt to anticipate the specific applications in which such handles might be necessary or useful, but simply attempted to ensure that the

necessary ID infrastructure was in place to support such element referencing wherever a need might arise.

IDREF/ID LINKING ACROSS DIFFERENT NAMESPACES

As is described above, the elements of mdSecType (<dmdSec>, <techMD>, <rightsMD>, <sourceMD> and <digiprovMD>) all have required ID attributes. The unique identifier values assigned to these attributes allow these elements to be referenced from the DMDID and/or ADMID attributes that are associated with <file> and elements. The mdSecType elements can all include metadata in the form of elements drawn from other namespaces in their <xmlData> sections. And in cases where the elements drawn from other namespaces for populating the <xmlData> sections themselves have ID attributes, as is the case with some elements drawn from the MODS and VRACORE namespaces, the DMDID and ADMID attributes can reference identifier values assigned to these ID attributes instead of or in addition to the values assigned to ID attributes in the top level mdSecType element (e.g., <dmdSec>).

EXAMPLE

The example below includes a <dmdSec> with very abbreviated VRA encoded descriptive metadata. These metadata include a description of a print series, a description of a single print from this series, and descriptions of multiple images. The various other parts of the METS document reference the pertinent sections of the VRA encoding by citing ID values identifying elements in the VRA namespace. For example, each <file> element in the <fileSec> uses its DMDID attribute to cite the ID attribute value that identifies the <vra:image> element that describes it. The root element in the mets <structMap> uses its DMDID attribute to cite the ID attribute value that identifies the <vra: work> element that describes the print series as a whole; and the that is the immediate child of the root element, and which represents a single print from the series, uses its DMDID attribute to cite the ID attribute value that identifies the <vra:work> element that describes the individual print.

```
<mets:mets xmlns:mets="http://www.loc.gov/METS/"
xmlns:vra="http://www.vraweb.org/vracore4.htm" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.loc.gov/METS/ http://www.loc.gov/standards/mets/mets.xsd
http://www.vraweb.org/vracore4.htm http://gort.ucsd.edu/escowles/vracore4/vra-4.0-
strict.xsd" OBJID="ark:/13030/kt9s2009hz" LABEL="Los Caprichos">
   <mets:dmdSec ID="DMD1">
       <mets:mdWrap MDTYPE="VRA">
           <mets:xmlData>
               <vra:vra>
                   <vra:work id="WORK1">
                       <vra:agentSet>
                           <vra:display>Francisco Goya (Spanish, 1746-1828)</vra:display>
                           <vra:agent>
                               <vra:name vocab="ULAN" refid="500035328">Goya,Francisco
                               </vra:name>
                               <vra:dates type="life">
                                   <vra:earliestDate>1746</vra:earliestDate>
                                   <vra:latestDate>1828</vra:latestDate>
                               </vra:dates>
                               <vra:culture>Spanish</vra:culture>
                               <vra:role vocab="AAT" refid="300025164">printmaker
                               </vra:role>
                           </vra:agent>
                       </vra:agentSet>
                       <vra:titleSet>
                           <vra:display>Los Caprichos</vra:display>
                           <vra:title type="creator" pref="true"xml:lang="es">Los
                           Caprichos</vra:title>
                       </vra:titleSet>
                       <vra:worktypeSet>
                           <vra:display>print series</vra:display>
                           <vra:worktype>print series</vra:worktype>
                       </vra:worktypeSet>
                   </vra:work>
                   <vra:work id="WORK2">
                       <vra:agentSet>
                           <vra:display>Francisco Goya (Spanish, 1746-1828)
                           </vra:display>
                           <vra:agent vocab="ULAN" refid=" 500035328">
                               <vra:dates type="life">
                                   <vra:earliestDate>1746</vra:earliestDate>
                                   <vra:latestDate>1828</vra:latestDate>
                               </vra:dates>
                               <vra:culture>Spanish</vra:culture>
                               <vra:role vocab="AAT"refid=" 300025164">printmaker
                               </vra:role>
                           </vra:agent>
                       </vra:agentSet>
                       <vra:descriptionSet>
                           <vra:description>Man, asleep at a table, surrounded by demonic-
                            looking animals and birds. Originally intended as the
                            frontispiece for the series.</vra:description>
                       </vra:descriptionSet>
                       <vra:titleSet>
                           <vra:display> El Sueño de la Razon Produce Monstruos (The Sleep
                            of Reason Produces Monsters)</vra:display>
                           <vra:title type="creator" pref="true"xml:lang="es">El Sueño de
                            la Razon Produce Monstruos</vra:title>
                           <vra:title type="translated" pref="true" xml:lang="en">The
                            Sleep of Reason Produces Monsters</vra:title>
                       </vra:titleSet>
                   </vra:work>
                   <vra:image id="IMAGE1">
                       <vra:measurementsSet>
                           <vra:display>349 x 520 pixels</vra:display>
                           <vra:measurements type="width" unit="pixels"extent=
                            "overall">349</vra:measurements>
                           <vra:measurements type="height" unit="pixels"extent=
                            "overall">520</vra:measurements>
                       </vra:measurementsSet>
```

```
                    <vra:titleSet>
                        <vra:display>Full view</vra:display>
                        <vra:title type="descriptive">Full view</vra:title>
                    </vra:titleSet>
                </vra:image>
                <vra:image id="IMAGE2">
                    <vra:measurementsSet>
                        <vra:display>459 x 683 pixels</vra:display>
                        <vra:measurements type="width" unit="pixels"extent=
                         "overall">459</vra:measurements>
                        <vra:measurements type="height" unit="pixels"extent=
                         "overall">683</vra:measurements>
                    </vra:measurementsSet>
                    <vra:titleSet>
                        <vra:display>Large full view</vra:display>
                        <vra:title type="descriptive">Large full view</vra:title>
                    </vra:titleSet>
                </vra:image>
                <vra:image id="IMAGE3">
                    <vra:measurementsSet>
                        <vra:display>111 x 165 pixels</vra:display>
                        <vra:measurements type="width" unit="pixels"extent=
                         "overall">111</vra:measurements>
                        <vra:measurements type="height" unit="pixels"extent=
                         "overall">165</vra:measurements>
                    </vra:measurementsSet>
                    <vra:titleSet>
                        <vra:display>Thumbnail view</vra:display>
                        <vra:title type="descriptive">Thumbnail view</vra:title>
                    </vra:titleSet>
                </vra:image>
            </vra:vra>
        </mets:xmlData>
    </mets:mdWrap>
</mets:dmdSec>
<mets:fileSec>
    <mets:fileGrp USE="Full view">
        <mets:file ID="FID1" MIMETYPE="image/jpg" DMDID="IMAGE1">
            <mets:FLocat xlink:href="http://www.museum.cornell.edu/HFJ/permcoll/pdp/
             img_pr/monstros_l.jpg" LOCTYPE="URL"/>
        </mets:file>
    </mets:fileGrp>
    <mets:fileGrp USE="Large full view">
        <mets:file ID="FID2" MIMETYPE="image/jpg" DMDID="IMAGE2">
            <mets:FLocat xlink:href="http://www.museum.cornell.edu/HFJ/permcoll/pdp/
             img_pr/monstros_X.jpg" LOCTYPE="URL"/>
        </mets:file>
    </mets:fileGrp>
    <mets:fileGrp USE="Thumbnail view">
        <mets:file ID="FID3" MIMETYPE="image/jpg" DMDID="IMAGE3">
            <mets:FLocat xlink:href="http://www.museum.cornell.edu/HFJ/permcoll/pdp/
             img_pr/monstros_s.jpg" LOCTYPE="URL"/>
        </mets:file>
    </mets:fileGrp>
</mets:fileSec>
<mets:structMap TYPE="physical">
    <mets:div TYPE="intaglio print series" LABEL="Los Caprichos" DMDID="WORK1">
        <mets:div TYPE="intaglio print" LABEL="El Sueño de la Razon Produce Monstruos
         (The Sleep of Reason Produces Monsters)"DMDID="WORK2">
            <mets:fptr FILEID="FID1"/>
            <mets:fptr FILEID="FID2"/>
            <mets:fptr FILEID="FID3"/>
        </mets:div>
    </mets:div>
</mets:structMap>
</mets:mets>
```

LINKING VIA XLINK ATTRIBUTES.

XLink is a specification for an XML linking language. Essentially XLink provides for a number of named attributes which can be used to specify linking relationships between two resources and to associate metadata with these links. (The specification is available at http://www.w3.org/TR/xlink/) The XLink specification does not include a normative implementation of the standard, and developers are left to implement their own XLink schemas or DTDs. The implementers of the METS standard have provided an XLink schema for use with METS. Attributes declared in this XLink schema are used in two main ways in METS.

LINKING TO EXTERNAL RESOURCES.

METS uses XLink attributes from the Xlink "simpleLink" attribute group to provide links to external resources from elements within METS. Specifically, the xlink:href attribute is used to specify the URL of the pertinent external resource; and the xlink:role, xlink:arcrole, xlink:title, xlink:show, and xlink:actuate can be used to specify or associate pertinent metadata with the specified xlink:href link. (For more information on the use of specific xlink attributes, see the attribute tables associated with specific METS elements as well as the XLink specification.) The XLink simpleLink attributes can be used in two main contexts in METS.

CONTEXT 1: THE <MDREF> SUB-ELEMENT IN ELEMENTS OF MDSECTYPE.

The <mdRef> element in <dmdSec>, <techMD>, <rightsMD>, <sourceMD> and <digiprovMD> elements uses the xlink:href attribute to point to the external resource containing the pertinent metadata. In addition, the other xlink simpleLink attributes could be used to describe this link.

EXAMPLE

In the <dmdSec> below, the xlink:href attribute cites a URL that identifies the location of an external, EAD based description.

```
<mets:dmdSec ID="DMD1">
    <mets:mdRef  LABEL="Patrick Breen Papers" xlink:href=
     "http://sunsite2.berkeley.edu/cgi-bin/oac/calher/breenpapers"
     LOCTYPE="URL" MDTYPE="EAD" XPTR="xpointer(id('xyzj0098'))"/>
</mets:dmdSec>
```

CONTEXT 2: THE <FLOCAT> SUB-ELEMENT OF THE <FILE> ELEMENTS IN THE <FILESEC>.

The <FLocat> element uses an xlink:href attribute to point to the pertinent content file in its external location. The other XLink simpleLink attributes can be used to describe this link.

EXAMPLE

In the example below, the xlink:href attribute uses a URL to identify the location of the pertinent external content file.

```
<mets:fileGrp USE="Full view">
    <mets:file ID="FID1" MIMETYPE="image/jpg" DMDID="IMAGE1">
        <mets:FLocat xlink:href="http://www.museum.cornell.edu/HFJ/
         permcoll/pdp/img_pr/monstros_l.jpg" LOCTYPE="URL"/>
    </mets:file>
</mets:fileGrp>
```

LINKING <DIV> ELEMENTS INTERNALLY IN <STRUCTLINK>.

The <structLink> section of a METS document can be used to express non-hierarchical, hyperlink type relationships between elements in the <structMap>. The best way to accomplish this is to assign a unique string value to the "xlink:label" attribute on each in the structMap that represents the

source node or the target node of a hyperlink relationship. An <smLink> element in the <structLink> section of the METS document can then define each hyperlink relationship by referencing the xlink:label attribute value for the representing a source node in its xlink:from attribute and the xlink:label attribute value for the representing the target node in its xlink:to attribute. For more information on the use of XLink attributes for establishing hyperlink relationships, see below.

EXAMPLE

See Examples 1 and 2 from the <structLink> section of this manual

WRAPPING METADATA AND DIGITAL CONTENT IN METS

METS provides a means both for wrapping metadata conforming to externally defined formats and for wrapping digital content of any type directly in a METS object. It accomplishes this through its <xmlData> and <binData> elements. These elements can occur in different contexts as is described below.

<XMLDATA>

NAMESPACE CONCEPTS AND <XMLDATA>

- Any XML schema can declare a target namespace. This takes the form of a URI intended to serve as a unique identifier for the specific context represented by the schema. For example, the target namespace declared by the METS schema is "http://www.loc.gov/METS/"

- An element declared in a particular schema can be unambiguously referenced in any xml context by first identifying the target namespace from which the element is being drawn and then specifying the name of the element. Often an instance document accomplishes this by associating a different prefix with the URI for each target namespace it declares, and then using the appropriate prefix in combination with each element name appearing in the document to identify the namespace from which the element is drawn. For example, once an instance document has associated the prefix "mods" with the namespace identified by the URI "http://www.loc.gov/mods/v3" it can use <mods:titleInfo> unambiguously to reference the <titleInfo> element as it is declared in version 3 of the MODS schema.

- The target namespace URI is an identifier, and is not necessarily resolvable. It does not specify the location of a schema that implements the namespace context that it identifies. XML documents, however, can associate each namespace context they declare with a specific schema and location by means of a schemaLocation attribute. Doing this allows an XML parser/validator to check all of the elements in an XML document against the specific schemas in which they are declared.

- Some schema, such as METS, allow instance documents conforming to the schema to use elements declared in any external namespaces or in no namespace in certain contexts. The METS <xmlData> elements provide such contexts.

METS <XMLDATA> ELEMENTS

METS <xmlData> elements serve as wrappers for xml content whose constituent elements may be drawn from any namespace or from no namespace. The <xmlData> elements specify a "processContents" directive of "lax," which means that an xml validator will check the xml elements appearing within the <xmlData> element for validity if and only if the METS instance document declares the namespace that governs the elements and specifies a valid schemaLocation for a schema that implements the namespace. If a namespace is not declared for the elements, or if the governing schema cannot be found, then an XML validator will check the xml within the <xmlData> element for well-formedness, but not for validity.

<xmlData> elements as described above appear in the following contexts in METS:

CONTEXT 1: THE <MDWRAP> ELEMENTS OF THE "MDSECTYPE".

These include:

- <dmdSec> Typically in this context, the <xmlData> element would contain elements from an xml-based descriptive metadata format such as MODS, MARCXML, DC, VRA, etc.

- <techMD>, <rightsMD>, <sourceMD> and <digiprovMD> in an <amdSec>: Typically in these contexts the <xmlData> element would contain elements from an xml-based administrative metadata format such as MIX (for <techMD> about images) or PREMIS (for <digiprovMD> about digital content).

CONTEXT 2: <FCONTENT> ELEMENTS ASSOCIATED WITH <FILE> ELEMENTS IN THE <FILESEC>.

If the digital content represented by a <file> element is in XML format, and a METS implementer wishes to incorporate that content directly in the <file> element, then the XML comprising the content can appear directly in a FContent/xmlData element.

<BINDATA>

The METS <binData> elements serve as wrappers for base64 encoded binary content. METS implementers would use this element when they wish to include non-xml metadata or digital content directly in the METS document.

A <binData> element as described above can appear in each of the following contexts.

CONTEXT 1: THE <MDWRAP> ELEMENT OF ELEMENTS OF THE "MDSECTYPE".

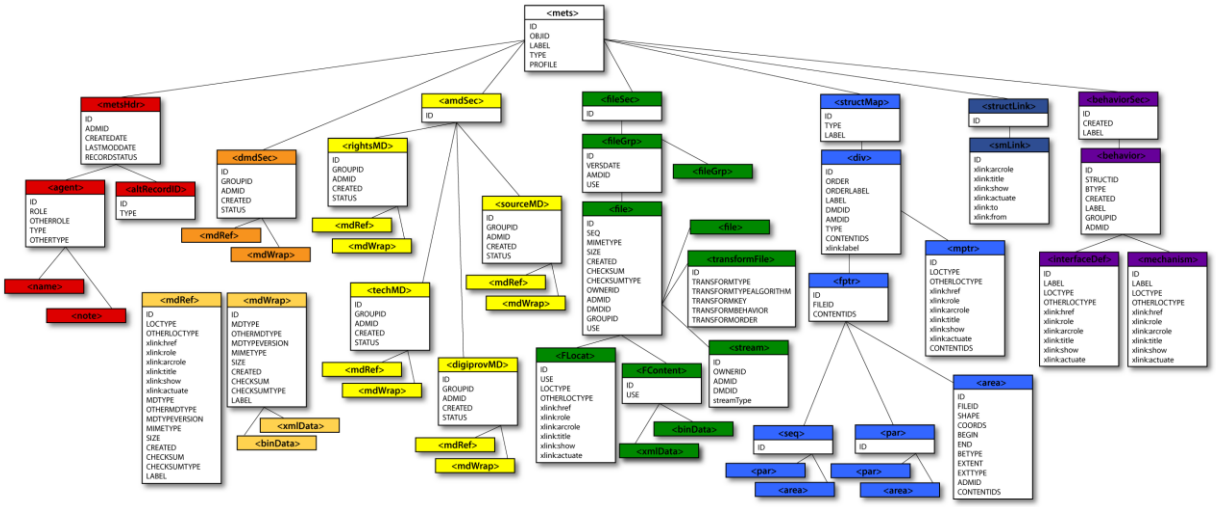
The <binData> element allows the METS <dmdSec>, <techMD>, <rightsMD>, <sourceMD> and <digiprovMD> elements to wrap non-XML content. For example, by means of the <binData> element, a <dmdSec> could include a full, standard ISO 2709 MARC format record describing the resource represented by the METS document. In this case, the METS implementer would encode the MARC record in base64 binary format and then wrap this encoding in a dmdSec/mdWrap/binData element. (Note that an alternative to this approach would be to include an XML encoding that conforms to the MARC 21 XML Schema in an dmdSec/mdWrap/xmlData element).

CONTEXT 2: THE <FCONTENT> ELEMENT OF A <FILE> ELEMENT.

If the digital content represented by a <file> element is not in XML format it can be encoded in a <file> element using the base64 binary format and then wrapping that encoding in a file/Fcontent/binData element.

ELEMENTS OF ANYTYPE: <STREAM> AND <TRANSFORMFILE>.

METS has two elements declared as "anyType," both of which can appear in the context of a <file> element. These elements can include any attributes in addition to those explicitly defined for the elements. They can also contain any combination of character data and elements so long as this content is well-formed XML.



CHAPTER 5: PROFILES

PURPOSE OF METS PROFILES

One of the most advantageous features of the METS schema is its flexibility; it can be adapted to fit local practice as well as locally-developed tools and work flows. This same flexibility can also be a disadvantage, however, when institutions are looking to transfer METS files between and among each other for any number of purposes. As a mechanism to allow flexibility, but also to establish common practice among METS users, a METS profile schema has been developed along with a formal registration process that makes the profiles visible to others looking to implement and/or share data and metadata among those using a given profile.

COMPONENTS OF A METS PROFILE

A METS profile can accomplish a number of purposes for an institution and for the METS community at large. The METS website provides a description of the components of a METS profile [http://www.loc.gov/standards/mets/profile_docs/components.html], and the full set of elements specified and required by the profile schema. By making use of all the components, an institution not only declares how it builds a METS document of a certain digital object type, or for a specific application or purpose, but can also provide an implicit description of the data model used for internal METS document creators, METS tool developers, and external recipients of their METS documents. This information can be an invaluable means to convey succinctly the critical information necessary to disaggregate a METS document for disposal within another institutional repository, for instance, or for the use of searching, navigating, displaying, and rendering applications or tools. Note that while the profile scheme is expressed as an XML schema (.xsd), it is nevertheless designed to provide a *narrative* description of the way the declared class of METS documents are intended to be created rather than a machine-actionable method for judging conformance to the profile.

PROFILE DEVELOPMENT

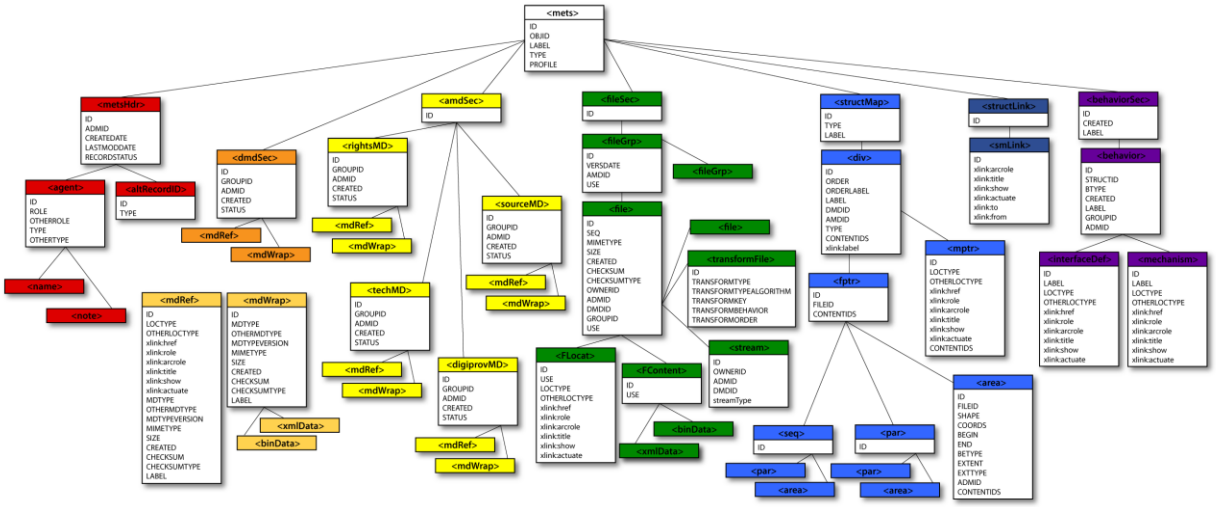
A sample METS profile document is available in the Profile section of the METS website, [http://www.loc.gov/standards/mets/profile_docs/mets_profile_example.xml] as well as within each of the profiles registered on the METS site [http://www.loc.gov/standards/mets/mets-registered-profiles.html]. For an excellent explication of the issues faced in constructing one of the profiles registered by the Library of Congress, see a presentation made by Morgan Cundiff from the Network Standards and Development Office on the METS website.

The METS Editorial Board strongly encourages institutions to register the profiles that they are using within their institutions for the purposes of not only of sharing METS documents, but also to establish common practice among institutions. Recognizing, however, that institutions are often reluctant to register formally a profile until its use has been tested within a local institution, and perhaps among several institutions, a METS Profile Playground has been established on the METS wiki. The METS Profile Playground is envisioned as a place where entire drafts or discrete components of a draft profile can be posted for discussion. For instance, members of the METS community may be interested in exploring various ways to describe the logical and physical structures of similar digital objects.

Questions or issues related to creating a METS profile can also be directed to the METS listserv and the METS listserv archives [http://sun8.loc.gov/listarch/mets.html]

PROFILE REGISTRATION

Once an institution is ready to register formally its profile, the process is fairly simple. The profile is first vetted for technical compliance with a subset of the METS Editorial Board, and then made available to the full METS community on the METS listserv for a short period of time. If no serious objections or concerns are expressed by either the Board or the METS community, the profile receives registration status and is listed on the METS website. Both current and deprecated versions of profiles are included on the METS website in case others in the METS community are relying upon a previous version of a registered schema. More specific documentation of the elements of the METS profile schema [http://www.loc.gov/standards/mets/profile_docs/mets.profile.v1-2.html] can also be found on the METS website.



CHAPTER 6: EXTERNAL SCHEMA AND CONTROLLED VOCABULARY

One of the main differences between METS and other content and metadata packaging specifications is its capability for organizing the metadata associated with a digital object into different categories. By means of the **<dmdSec>** and the **<amdSec>**, the metadata for a digital object can be separated into descriptive and administrative metadata sections within the METS document. The administrative metadata section can be subdivided further into other types of metadata including *technical* metadata for different data formats, *digital provenance* for preservation metadata, *source* for metadata relating to an analog or digital item from which the digital object being described in the METS document derives, and *rights* metadata. Two mechanisms can be used to associate these different categories of metadata with the digital object and/or its components – either by including the metadata within the METS document using an <mdWrap> element, or pointing to an external location for the metadata using an <mdRef> element. More complete explanations about how to use these elements can be found within Chapter 3.

METS is, in general, agnostic regarding the external descriptive or administrative metadata schemes that its implementers choose to use for their digital objects. There are, however, well-known, community-based standards that are recognized by the METS Board as being commonly used. For purposes of convenience, this group of metadata standards is included as an attribute group within the schema that is referenced by the MDTYPE attribute associated with both <mdWrap> and <mdRef>. For other descriptive or administrative metadata schema not included in the attribute group, the scheme being used can be declared by choosing the OTHER value for the MDTYPE attribute and naming it in an additional attribute called OTHERMDTYPE. Note that declaration of which scheme being used is required by the METS schema and best practice does suggest that, if OTHER is used, OTHERMDTYPE should also be used, especially when using METS as a transmission protocol.

DESCRIPTIVE METADATA SCHEMES

Descriptive metadata, often called "bibliographic" metadata, is probably most familiar to those using search engines which find digital objects by their author, title, subject, or other information that describes the digital object. The descriptive metadata schemes endorsed by the METS Board to date include:

- Data Documentation Initiative (DDI) used for describing social science data sets.
- Dublin Core, simple (DC) developed by the Dublin Core Metadata Initiative as a core set of metadata terms useful for all kinds of digital objects

• Encoded Archival Description (EAD) used by archives and libraries to encode archival and manuscript collections.

• Federal Geographic Data Committee metadata standard (FGDC) describes geospatial materials. FGDC also includes some technical and preservation metadata for geospatial items.

• Learning Resource Metadata (LOM), a metadata scheme developed by the IMS Global Learning Consortium, Inc. to describe digital resources created and used by the education and learning communities.

• MAchine Readable Cataloging (MARC), used for a number of years by libraries around the world to describe all kinds of analog and digital materials.

• Metadata Object Description Schema (MODS) more recently developed in a community effort spearheaded by the Library of Congress to describe all kinds of digital objects. MODS was designed to work with METS, so is advantageous from that point of view.

• Text Encoding Initiative Header (TEIHDR), the section of the Text Encoding Initiative encoding schema which contains descriptive metadata associated with the TEI encoded texts.

• Visual Resources Association (VRA), a metadata scheme for describing visual images.

More information can be found about how to use each of these schemes at the links provided. Examples of how many of these metadata schemes are used within a METS document can be found by reviewing the METS profiles as each of those profiles declare the external schema required to build a METS document based on the given profile.

ADMINISTRATIVE METADATA SCHEMES

Administrative metadata is, in many ways, a much less clear-cut category of metadata than what is traditionally considered descriptive metadata. While METS does distinguish different types of administrative metadata, it is also possible to include all metadata not considered descriptive into the <amdSec> without distinguishing the types of administrative metadata further. It still will be necessary to declare the MDTYPE of the metadata as discussed above and as part of the <amdSec> discussions found within Chapter 3, so the METS author/ implementer will need to find a way to declare to those using the METS documents what administrative metadata type(s) are being included. To date, the administrative metadata schemes endorsed by the METS Board include:

• Technical metadata for audiovisual formats as specified by the Library of Congress A/V prototyping project (LC-AV).

• NISO Technical Metadata for Digital Still Images (NISOIMG), a metadata scheme described by a data dictionary that can be used to describe a number of formats of still images.

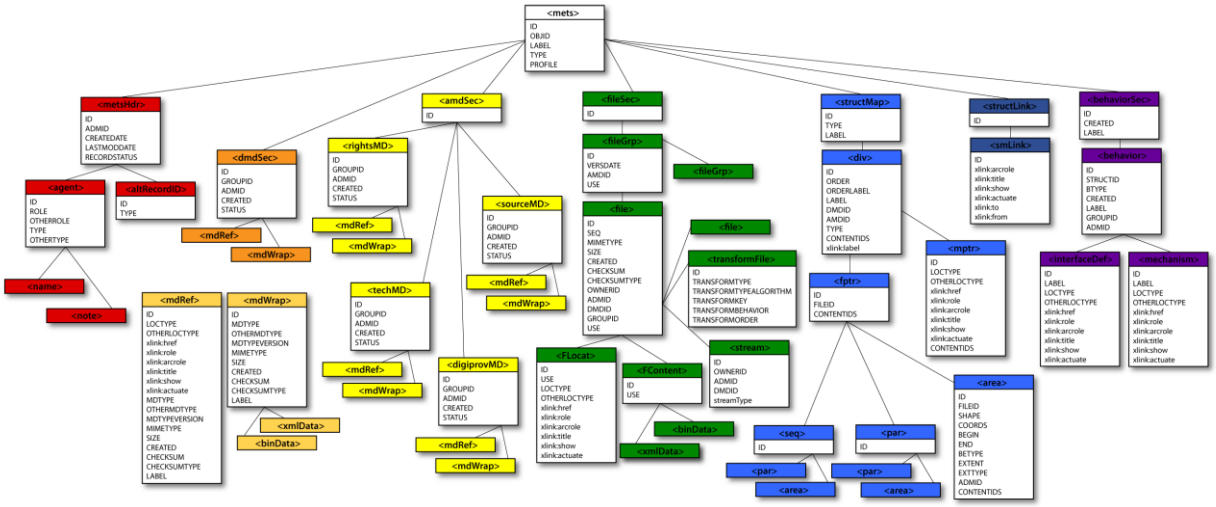
• Preservation metadata developed by the OCLC-RLG PREservation Metadata: Implementation Strategies Working Group (PREMIS).

As with descriptive metadata above, more information can be found about how to use each of these administrative schemes at the links provided. Examples of how many of these metadata schemes are used within a METS document can be found by reviewing the METS profiles as each of those profiles declare the external schemes required to build a METS document based on the given profile.

ENDORSED EXTERNAL SCHEMATA

Not all of the metadata schemes listed above that are included in the attribute group have XML schemata that are endorsed by the METS Editorial Board. Usually, the METS Editorial Board endorses a particular

XML schema only when it has been officially sanctioned by the organization supporting its development. The list of schemata endorsed by the METS Editorial Board can be found on the METS website.



GLOSSARY

ARK: Archival Resource Key - http://www.cdlib.org/inside/diglib/ark/

ARCHIVIST - from <agent> ROLE attribute

AudioMD - Audio Technical Metadata Schema (under review)

BYTE - (from BETYPE element) a byte offset

CDL - California Digital Library

CREATOR - from <agent> ROLE attribute

CUSTODIAN - from <agent> ROLE attribute

dateTime – Represents an instant in time, typically addressed as a date and time of day

DC - Dublin Core

DDI - Data Documentation Initiative

DISSEMINATOR - from <agent> ROLE attribute

DLF – Digital Library Federation http://www.diglib.org

DOI - Digital Object Identifier. Developed by the International DOI Foundation (IDF), DOI is a system for identifying content objects in the digital environment. See http://www.doi.org/

EAD - Encoded Archival Description http://www.loc.gov/ead/

DISSEMINATOR - from <agent> ROLE attribute

EDITOR - from <agent> ROLE attribute

FGDC - (U.S.) Federal Geographic Data Committee Metadata

HANDLE - Corporation for National Research Initiatives HANDLE System – a general-purpose global name service enabling secure name resolution over the Internet. See http://www.handle.net/ ;

ID - represents a unique ID name for the attribute that identifies the element within the context of the document. ID is used primarily to process the document. The value for an ID must be valid XML IDREF is a type that allows the value of one attribute to be an element elsewhere in the document provided that the value of the IDREF is the ID values of the referenced element. See Chapter 4.

IDREF - (from BETYPE) an XML ID value for an element in the content file.

IPOWNER - Intellectual Property Owner – from <agent> ROLE attribute

LC AV - Library of Congress Audiovisual Metadata

MARC - MAchine Readable Cataloging http://www.loc.gov/marc/

METS - Metadata Encoding and Transmission Standard http://www.loc.gov/standards/METS

MIDI Musical Instrument Digital Interface

MIX - Metadata for Images in XML http://www.loc.gov.standards/mix/

MOA2 - Making of American 2 – http://sunsite.berkeley.edu/MOA2/MODS – Metadata Object Description Schema – http://www.loc.gov/standards/mods/

MIX - Metadata for Images in XML http://www.loc.gov.standards/mix/

NISO Technical Metadata for Still Images - http://www.niso.org/standards/resources/Z39_87_trail_use.pdf

NISOIMG - NISO Technical Metadata for Digital Still Images

OPAC - Online Public Access Catalog

OTHER - from <agent> ROLE attribute

PRESERVATION - from <agent> ROLE attribute

PURL- Persistent Uniform Resource Locator. See http://purl.oclc.org/ ;

RightsDelarationMD Schema - See http://www.loc.gov/standards/rights/METSRights.xsd .

OTHER - from <agent> ROLE attribute

SMIL - Synchronized Multimedia Integration Language time value

SMPTE-25 - SMPTE time code for 25 frame per second material.

SMPTE-24 - SMPTE time code for 24 frame per second material.

SMPTE-DF30 – SMPTE time code for 30 frame per second frame material.

SMPTE-NDF30 - SMPTE time code for 30 frame per second non-drop material.

SMPTE-DF29.97 - SMPTE time code for 29.97 frame per second drop frame material.

SMPTE-NDF29.92 - SMPTE time code for 29.97 frame per second non drop material.

String – Ordered sequence of symbols

TCF - a Time Code Format.

TEI - Text Encoding Initiative http://www.tei-c.org

TEIHDR -TEI Header

TextMD - A schema for technical metadata for TEXT

TIFF – Tagged Image File Format

TIME - a simple time code of the form HH:MM::SS

TCF - a Time Code Format.

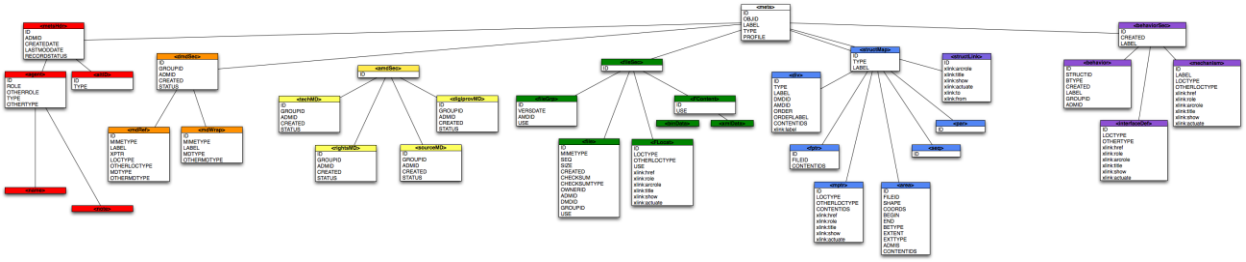
URL - Uniform Resource Locator. See the functional requirements and overall framework for Uniform Resource locators as specified in RFC 1738 Berners-Lee, Masinter & McCahill. See also an overview of W3C materials related to Addressing including URIs and URLs at http://www.w3.org/Addressing/;

URN - Uniform Resource Name. See the functional requirements and overall framework for Uniform Resource Names as specified in RFC 1737 Sollins & Masinter and the specification for the URN syntax in RFC 2141 Moats

VIDEOMD – Video Technical Metadata Schema (under review)

VRA – Visual Resources Association Core Elements http://www.vrawebrg/vracore3.htm

XML - Extensible Markup Language



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Cundiff, Morgan V. (2004). An Introduction to the Metadata Encoding and Transmission Standard (METS). Library Hi Tech, 22(1) 52-64.

DOI: Digital Object Identifier. http://www.doi.org.

HANDLE: Corporation for National Research Initiatives, HANDLE System. http://www.handle.org.

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PURL: Persistent Uniform Resource Locators. http://purl.oclc.org.

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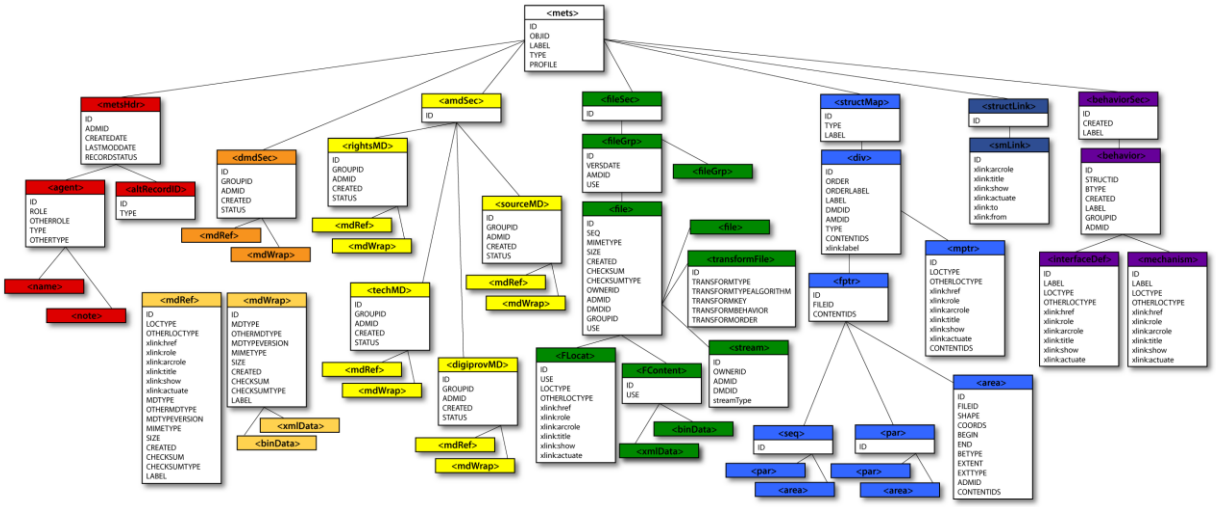

APPENDIX A: THE FULL METS DOCUMENT

```
1.  <?xml version="1.0" encoding="UTF-8"?>
2.  <mets:mets xmlns:mets="http://www.loc.gov/METS/" xmlns:mods="http://www.loc.gov/mods/v3"
    xmlns:rts="http://cosimo.stanford.edu/sdr/metsrights/" xmlns:mix="http://www.loc.gov/mix/"
    xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
    instance" xsi:schemaLocation="http://www.loc.gov/METS/
    http://www.loc.gov/standards/mets/mets.xsd http://www.loc.gov/mods/v3
    .http://www.loc.gov/mods/v3/mods-3-1.xsd
3.  http://www.loc.gov/mix/
4.  http://www.loc.gov/mix/mix.xsd
5.  http://cosimo.stanford.edu/sdr/metsrights/
6.  http://cosimo.stanford.edu/sdr/metsrights.xsd"
7.  OBJID="ark:/13030/kt9s2009hz" LABEL="Martial Epigrams">
8.      <mets:metsHdr CREATEDATE="2006-05-09T10:30:00">
9.          <mets:agent ROLE="CREATOR">
10.             <mets:name>Rick Beaubien</mets:name>
11.         </mets:agent>
12.     </mets:metsHdr>
13.     <mets:dmdSec ID="DMD1">
14.         <mets:mdWrap MIMETYPE="text/xml" MDTYPE="MODS" LABEL="MODS record">
15.             <mets:xmlData>
16.                 <mods:mods version="3.1">
17.                     <mods:titleInfo>
18.                         <mods:title>Epigrams</mods:title>
19.                             </mods:titleInfo>
20.                     <mods:name type="personal">
21.                         <mods:namePart>Martial</mods:namePart>
22.                     </mods:name>
23.                     <mods:name type="personal">
24.                         <mods:namePart>Ker, Walter C. A. (Walter Charles Alan),
25.                          1853-1929</mods:namePart>
26.                     </mods:name>
27.                         <mods:typeOfResource>text</mods:typeOfResource>
28.                     <mods:originInfo>
29.                         <mods:place>
30.                             <mods:placeTerm type="text">London</mods:placeTerm>
31.                         </mods:place>
32.                         <mods:publisher>William Heinemann</mods:publisher>
33.                 <mods:dateIssued point="start">1927</mods:dateIssued>
34.                     <mods:dateIssued point="end">1943</mods:dateIssued>
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    and notes that is was originally published in 1920 and                                reprinted
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    without compliance with US Copyright formalities                                   and because
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1767.                <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/full/
                  11.tif” LOCTYPE="URL"/>
1768.             </mets:file>
1769.             <mets:file ID="epi12m" MIMETYPE="image/tiff" GROUPID=”epi12”
    ADMID="TECHTIFF12">
1770.                <mets:FLocat xlink:href=”http”//www.loc.gov/standards/mets/docgroup/full/
                  12.tif” LOCTYPE="URL"/>
1771.             </mets:file>
1772.             <mets:file ID="epi13m" MIMETYPE="image/tiff" GROUPID=”epi13”
    ADMID="TECHTIFF13">
1773.                <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/full/
                  13.tif” LOCTYPE="URL"/>
1774.             </mets:file>
1775.             <mets:file ID="epi14m" MIMETYPE="image/tiff" GROUPID=”epi14”
    ADMID="TECHTIFF14">
```
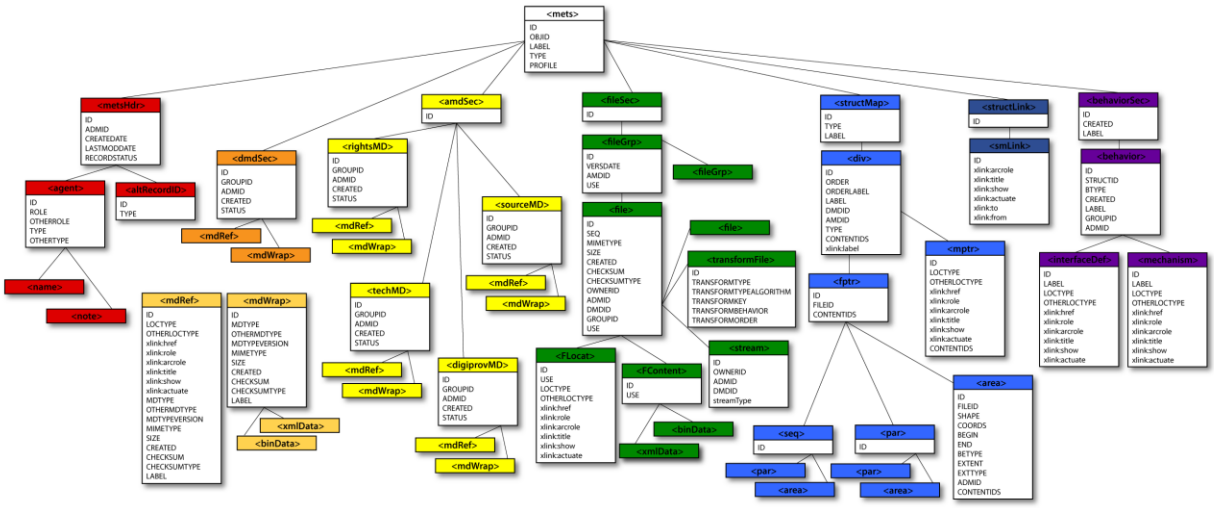

```
1776.                  <mets:FLocat xlink:href=”http://ww.loc.gov/standards/mets/docgroup/full/
              14.tif" LOCTYPE=”URL”/>
1777.               </mets:file>
1778.            </mets:fileGrp>
1779.            <mets:fileGrp USE="reference image">
1780.               <mets:file ID="epi01r" MIMETYPE="image/jpeg" GROUPID=”epi01”
    ADMID="TECHJPG01">
1781.                  <mets:FLocat xlink:href=:http://www.loc.gov/standrads/mets/docgroup/jpg/
                   01.jpg” LOCTYPE=”URL”/>
1782.               </mets:file>
1783.               <mets:file ID="epi02r" MIMETYPE="image/jpeg" GROUPID=”epi02”
    ADMID="TECHJPG02">
1784.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              02.jpg" LOCTYPE=”URL”/>
1785.               </mets:file>
1786.               <mets:file ID="epi03r" MIMETYPE="image/jpeg" GROUPID=”epi03”
    ADMID="TECHJPG03">
1787.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
                    03.jpg” LOCTYPE="URL"/>
1788.               </mets:file>
1789.               <mets:file ID="epi04r" MIMETYPE="image/jpeg" GROUPID=”epi04”
    ADMID="TECHJPG04">
1790.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
1791.                   04.jpg” LOCTYPE="URL"/>
1792.               </mets:file>
1793.               <mets:file ID="epi05r" MIMETYPE="image/jpeg" GROUPID=”epi05”
    ADMID="TECHJPG05">
1794.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              05.jpg” LOCTYPE="URL"/>
1795.               </mets:file>
1796.               <mets:file ID="epi06r" MIMETYPE="image/jpeg" GROUPID=”epi06”
    ADMID="TECHJPG06">
1797.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              06.jpg” LOCTYPE="URL"/>
1798.               </mets:file>
1799.               <mets:file ID="epi07r" MIMETYPE="image/jpeg" GROUPID=”epi07”
    ADMID="TECHJPG07">
1800.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              07.jpg” LOCTYPE="URL"/>
1801.               </mets:file>
1802.               <mets:file ID="epi08r" MIMETYPE="image/jpeg" GROUPID=”epi08”
    ADMID="TECHJPG08">
1803.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              08.jpg” LOCTYPE="URL"/>
1804.               </mets:file>
1805.               <mets:file ID="epi09r" MIMETYPE="image/jpeg" GROUPID=”epi09”
    ADMID="TECHJPG09">
1806.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              09.jpg” LOCTYPE="URL"/>
1807.               </mets:file>
1808.               <mets:file ID="epi10r" MIMETYPE="image/jpeg" GROUPID=”epi10”
    ADMID="TECHJPG10">
1809.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              10.jpg” LOCTYPE="URL"/>
1810.               </mets:file>
1811.               <mets:file ID="epi11r" MIMETYPE="image/jpeg" GROUPID=”epi11”
    ADMID="TECHJPG11">
1812.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              11.jpg” LOCTYPE="URL"/>
1813.               </mets:file>
1814.               <mets:file ID="epi12r" MIMETYPE="image/jpeg" GROUPID=”epi12”
    ADMID="TECHJPG12">
1815.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              12.jpg” LOCTYPE="URL"/>
1816.               </mets:file>
1817.               <mets:file ID="epi13r" MIMETYPE="image/jpeg" GROUPID=”epi13”
    ADMID="TECHJPG13">
1818.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
              13.jpg” LOCTYPE="URL"/>
1819.               </mets:file>
```

```
1820.              <mets:file ID="epi14r" MIMETYPE="image/jpeg" GROUPID=”epi14”
    ADMID="TECHJPG14">
1821.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/jpg/
                14.jpg” LOCTYPE="URL"/>
1822.              </mets:file>
1823.          </mets:fileGrp>
1824.          <mets:fileGrp USE="thumbnail image">
1825.              <mets:file ID="epi01t" MIMETYPE="image/gif" GROUPID=”epi01” ADMID="TECHGIF01">
1826.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                01.gif” LOCTYPE="URL"/>
1827.              </mets:file>
1828.              <mets:file ID="epi02t" MIMETYPE="image/gif" GROUPID=”epi02” ADMID="TECHGIF02">
1829.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                02.gif” LOCTYPE="URL"/>
1830.              </mets:file>
1831.              <mets:file ID="epi03t" MIMETYPE="image/gif" GROUPID=”epi03” ADMID="TECHGIF03">
1832.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                03.gif” LOCTYPE="URL"/>
1833.              </mets:file>
1834.              <mets:file ID="epi04t" MIMETYPE="image/gif" GROUPID=”epi04” ADMID="TECHGIF04">
1835.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                04.gif” LOCTYPE="URL"/>
1836.              </mets:file>
1837.              <mets:file ID="epi05t" MIMETYPE="image/gif" GROUPID=”epi05” ADMID="TECHGIF05">
1838.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                05.gif” LOCTYPE="URL"/>
1839.              </mets:file>
1840.              <mets:file ID="epi06t" MIMETYPE="image/gif" GROUPID=”epi06” ADMID="TECHGIF06">
1841.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                06.gif” LOCTYPE="URL"/>
1842.              </mets:file>
1843.              <mets:file ID="epi07t" MIMETYPE="image/gif" GROUPID=”epi07” ADMID="TECHGIF07">
1844.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                07.gif” LOCTYPE="URL"/>
1845.              </mets:file>
1846.                  <mets:file ID="epi08t" MIMETYPE="image/gif" GROUPID=”epi08”
    ADMID="TECHGIF08">
1847.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                08.gif” LOCTYPE="URL"/>
1848.              </mets:file>
1849.              <mets:file ID="epi09t" MIMETYPE="image/gif" GROUPID=”epi09” ADMID="TECHGIF09">
1850.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                09.gif” LOCTYPE="URL"/>
1851.              </mets:file>
1852.              <mets:file ID="epi10t" MIMETYPE="image/gif" GROUPID=”epi10” ADMID="TECHGIF10">
1853.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                10.gif” LOCTYPE="URL"/>
1854.              </mets:file>
1855.              <mets:file ID="epi11t" MIMETYPE="image/gif" GROUPID=”epi11” ADMID="TECHGIF11">
1856.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                11.gif” LOCTYPE="URL"/>
1857.              </mets:file>
1858.              <mets:file ID="epi12t" MIMETYPE="image/gif" GROUPID=”epi12” ADMID="TECHGIF12">
1859.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                12.gif” LOCTYPE="URL"/>
1860.              </mets:file>
1861.              <mets:file ID="epi13t" MIMETYPE="image/gif" GROUPID=”epi13” ADMID="TECHGIF13">
1862.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                13.gif” LOCTYPE="URL"/>
1863.              </mets:file>
1864.              <mets:file ID="epi14t" MIMETYPE="image/gif" GROUPID=”epi14” ADMID="TECHGIF14">
1865.                  <mets:FLocat xlink:href=”http://www.loc.gov/standards/mets/docgroup/gif/
                14.gif” LOCTYPE="URL"/>
1866.              </mets:file>
1867.          </mets:fileGrp>
1868.      </mets:fileSec>
1869.      <mets:structMap TYPE="physical">
1870.          <mets:div TYPE="book" LABEL="Martial Epigrams II" DMDID="DMD1" ADMID="ADMRTS1">
1871.              <mets:div TYPE="page" LABEL=" Blank page">
1872.                  <mets:fptr FILEID="epi01m"/>
1873.                  <mets:fptr FILEID="epi01r"/>
```

```
                <mets:fptr FILEID=" epi01t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page i: Half title page">
                <mets:fptr FILEID="epi02m"/>
                <mets:fptr FILEID="epi02r"/>
                <mets:fptr FILEID="epi02t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page ii:Blank page">
                <mets:fptr FILEID="epi03m"/>
                <mets:fptr FILEID="epi03r"/>
                <mets:fptr FILEID="epi02t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page iii:Title page">
                <mets:fptr FILEID="epi04m"/>
                <mets:fptr FILEID="epi04r"/>
                    <mets:fptr FILEID="epi04t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page iv: Publication info">
                <mets:fptr FILEID="epi05m"/>
                <mets:fptr FILEID="epi05r"/>
                <mets:fptr FILEID="epi05t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page v: Table of contents">
                <mets:fptr FILEID="epi06m"/>
                <mets:fptr FILEID="epi06r"/>
                <mets:fptr FILEID="epi06t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page vi: Blank page">
                <mets:fptr FILEID="epi07m"/>
                <mets:fptr FILEID="epi07r"/>
                <mets:fptr FILEID="epi07t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page 1: Half title page">
                <mets:fptr FILEID="epi08m"/>
                <mets:fptr FILEID="epi08r"/>
                <mets:fptr FILEID="epi08t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page 2 (Latin)">
                <mets:fptr FILEID="epi09m"/>
                <mets:fptr FILEID="epi09r"/>
                <mets:fptr FILEID="epi09t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page 3 (English)">
                <mets:fptr FILEID="epi10m"/>
                <mets:fptr FILEID="epi10r"/>
                <mets:fptr FILEID="epi10t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page 4 (Latin)">
                <mets:fptr FILEID="epi11m"/>
                <mets:fptr FILEID="epi11r"/>
                <mets:fptr FILEID="epi11t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page 5 (English)">
                <mets:fptr FILEID="epi12m"/>
                <mets:fptr FILEID="epi12r"/>
                <mets:fptr FILEID="epi12t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page 6 (Latin)">
                <mets:fptr FILEID="epi13m"/>
                <mets:fptr FILEID="epi13r"/>
                <mets:fptr FILEID="epi13t"/>
            </mets:div>
            <mets:div TYPE="page" LABEL="Page 7 (English)">
                <mets:fptr FILEID="epi14m"/>
                <mets:fptr FILEID="epi14r"/>
                <mets:fptr FILEID="epi14t"/>
            </mets:div>
        </mets:div>
    </mets:structMap>
</mets:mets>
```



APPENDIX B: TABLES

TABLE 1: ELEMENT, ATTRIBUTE AND COMPLEX TYPE TABLES

COMPLEX TYPE	ELEMENTS OF THIS TYPE	ATTRIBUTES	MAY CONTAIN
<amdSecType>	<amdSec>	ID	<techMD> <rightsMD> <sourceMD> <digiprovMD>
<areaType>	<area>	ID FILEID SHAPE COORDS BEGIN END BETYPE EXTENT EXTYPE ADMID CONTENTIDS	
<behaviorSecType>	<behaviorSec>	ID CREATED LABEL	<behavior> <behaviorSec>
<behaviorType>	<behavior>	ID STRUCTID BTYPE CREATED LABEL GROUPID ADMID	<interfaceDef> <mechanism>

COMPLEX TYPE	ELEMENTS OF THIS TYPE	ATTRIBUTES	MAY CONTAIN
<divType>		ID ORDER ORDERLABEL LABEL DMDID ADMID TYPE CONTENTIDS xlink:label	 <mptr> <fptr>
<fileType>	<file>	ID MIMETYPE SEQ SIZE CREATED CHECKSUM CHECKSUMTYPE OWNERID ADMID DMDID GROUPID USE	<FLocat> <FContent> <stream> <transformFile> <file>
<mdSecType>	<dmdSec> <techMD> <rightsMD> <sourceMD> <digiprovMD>	ID GROUPID ADMID CREATED STATUS	<mdRef> <mdWrap>
<metsType>	<mets>	ID OBJID LABEL TYPE PROFILE	<metsHdr> <dmdSec> <amdSec> <fileSec> <structMap> <structLink> <behaviorSec>
<objectType>	<interfaceDef> <mechanism>	<ID> <LABEL> attributeGroup ref: LOCATION LOCTYPE OTHERLOCTYPE attributeGroup ref: xlink:simpleLink	
<seqType>	<seq>	ID	<area>
<structLinkType>	<structLink>	ID	<smLink>
<structMapType>	<structMap>	ID TYPE LABEL	

TABLE 2: ELEMENTS

NOTE: ∞ (UNBOUNDED)

ELEMENT	TYPE	MAY CONTAIN	HAS ATTRIBUTES	CONTAINED WITH-IN	MIN/ MAX
<agent>		<name> <note>	ID ROLE OTHERROLE TYPE OTHERTYPE	<metsHdr>	0/∞
<altRecordID>			ID TYPE		0/∞
<amdSec>	amdSecType	<techMD> <rightsMD> <sourceMD> <digiprovMD>	ID	<mets>	0/∞
<area>	areaType		ID FILEID SHAPE COORDS BEGIN END BETYPE EXTENT EXTYPE ADMID CONTENTIDS	<fptr> <par> <seq>	0/1 1/∞ 1/∞
<behavior>	behaviorType	<interfaceDef> <mechanism>	ID STRUCTID BTYPE CREATED LABEL GROUPID ADMID	<behaviorSec>	0/∞
<behaviorSec>	behaviorSecType	<behaviorSec> <behavior>	ID CREATED LABEL	<mets> <behaviorSec>	0/∞ 0/∞
<binData>	xsd:base64Binary			<mdWrap> <FContent>	0/1 0/1
<digiprovMD>	mdSecType	<mdRef> <mdWrap>	ID GROUPID AMDID CREATED STATUS	<amdSec>	0/∞

ELEMENT	TYPE	MAY CONTAIN	HAS ATTRIBUTES	CONTAINED WITH-IN	MIN/ MAX
<dmdSec>	mdSecType	<mdRef> <mdWrap>	ID GROUPID ADMID CREATED STATUS	<mets>	0/∞
	divType	<mptr> <fptr> 	ID ORDER ORDERLABEL LABEL DMDID ADMID TYPE CONTENTIDS xlink:label	<structMap> 	1 0/∞
<FContent>		<binData> <xmlData>	ID USE	<file>	0/1
<file>	fileType	<FLocat> <FContent> <stream> <transformFile> <file>	ID MIMETYPE SEQ SIZE CREATED CHECKSUM CHECKSUMTYPE OWNERID ADMID DMDID GROUPID USE	<fileGrp> <file>	0/∞ 0/∞
<fileGrp>	fileGrpType	<file> <fileGrp>	ID VERSDATE ADMID USE	<fileSec> <fileGrp>	0/∞ 0/∞
<fileSec>		<fileGrp>	ID	<mets>	0/∞
<FLocat>			ID USE _____ attributeGroup ref: LOCATION LOCTYPE OTHERLOCTYPE _____ attributeGroup ref: xlink:simpleLink	<file>	0/∞
<fptr>		<par> <seq> <area>	ID FILEID CONTENTIDS		0/∞

ELEMENT	TYPE	MAY CONTAIN	HAS ATTRIBUTES	CONTAINED WITH-IN	MIN/ MAX
<interfaceDef>	objectType		ID LABEL LOCATION xlink:simple	<behavior>	0/1
<mechanism>	objectType		ID LABEL LOCATION xlink:simple	<behavior>	1
<mdRef>			ID MIMETYPE SIZE CREATED CHECKSUM CHECKSUMTYPE LABEL XPTR _____ attributeGroup ref:LOCATION LOCTYPE OTHERLOCTYPE _____ attributeGroup ref:METADATA MDTYPE OTHERMDTYPE MDTYPEVERSION	<dmdSec> <techMD> <rightsMD> <sourceMD> <digproveMD>	0/1 0/1 0/1 0/1 0/1
<mdWrap>		<binData> <xmlData>	ID MIMETYPE SIZE CREATED CHECKSUM CHECKSUMTYPE LABEL _____ attributeGroup ref: METADATA MDTYPE OTHERMDTYPE MDTYPEVERSION	<dmdSec> <techMD> <rightsMD> <sourceMD> <digiprovMD>	0/1 0/1 0/1 0/1 0/1
<mets>	metsType	<metsHdr> <dmdSec> <amdSec> <fileSec> <structMap> <structLink> <behaviorSec>	ID OBJID LABEL TYPE PROFILE		
<metsHdr>		<agent> <altRecord>	ID ADMID CREATEDATE LASTMODDATE RECORDSTATUS	<mets>	0/1

ELEMENT	TYPE	MAY CONTAIN	HAS ATTRIBUTES	CONTAINED WITH-IN	MIN/ MAX
<mptr>			ID CONTENTIDS _____ attributeGroup ref:LOCATION LOCTYPE OTHERLOCTYPE _____ attributeGroup ref: LOCATION xlink:simpleLink		0/∞
<name>	xsd:string			<agent>	1
<note>	xsd:string			<agent>	0/∞
<par>		<area> <seq>	ID	<fptr>	0/∞
<rightsMD>	mdSecType	<mdRef> <mdWrap>	ID GROUPID ADMID CREATED STATUS	<amdSec>	0/∞
<seq>	seqType	<area>	ID	<fptr> <par>	0/1 1/∞
<smLink>		<par>	ID xlink:arcrole xlink:title xlink:show xlink:actuate xlink:to xlink:from	<structLink>	1/∞
<sourceMD>	mdSecType	<mdRef> <mdWrap>	ID GROUPID ADMID CREATED STATUS	<amdSec>	0/∞
<stream>	restricts xsd:anytype		ID OWNERID ADMID DMDID STREAMTYPE	<file>	0/∞
<structLink>	structLinkType	<smLink>	ID	<mets>	0/1
<structMap>	structMapType		ID TYPE LABEL	<mets>	1/∞

ELEMENT	TYPE	MAY CONTAIN	HAS ATTRIBUTES	CONTAINED WITH-IN	MIN/ MAX
<techMD>	mdSecType	<mdRef> <mdWrap>	ID GROUPID ADMID CREATED STATUS	<amdSec>	0/∞
<transformFile>	restricts: xsd:anyType		ID (v 1.6) TRANSFORMTYPE TRANSFORMALGORITHM TRANSFORMKEY TRANSFORMBEHAVIOR TRANSFORMORDER	<file)	0/∞
<xmlData>				<mdWrap> <FContent>	0/1 0/1

TABLE 3: ATTRIBUTES

ATTRIBUTE	TYPE	OPTIONAL/ REQUIRED	ATTRIBUTE OF ELEMENT
ADMID	xsd:IDREFS	Optional	<area> <areaType> <behavior> <behaviorType> <digiprovMD> <dmdSec> <file> <fileGrp> <fileGrpType> <metsHdr> <rightsMD> <sourceMD> <stream> <techMD>
BEGIN	xsd:string	Optional	<area> <areaType>
BETYPE (1)	xsd:string	Optional	<area> <areaType>
BTYPE	xsd:string	Optional	<behavior>
CHECKSUM	xsd:string	Optional	<file> <mdRef> <mdWrap>
CHECKSUMTYPE (2)	xsd:string	Optional	<file> <mdRef> <mdWrap>
CONTENTIDS	list or any URI	Optional	<area> <fptr> <mptr>
COORDS	xsd:string	Optional	<area>
CREATED	xsd:dateTime	Optional	<behavior> <behaviorSec> <digiprovMD> <dmdSec> <file> <rightsMD> <sourceMD> <techMD> <mdRef> <mdWrap>
CREATEDATE	xsd:dateTime	Optional	<metHdr>
DMDID	xsd:IDREFS	Optional	 <file> <stream>
END	xsd:string	Optional	<area>
EXTENT	xsd:string	Optional	<area>

ATTRIBUTE	TYPE	OPTIONAL/ REQUIRED	ATTRIBUTE OF ELEMENT
EXTTYPE (1)	xsd:string	Optional	<area>
FILEID	xsd:IDREF	Optional	<area> <fptr>
ID	xsd:ID	Optional	All elements except those below and <name>, <note>.
		Required	<digiprovMD> <dmdSec> <file> <rightsMD> <sourceMD> <techMD>
GROUPID	xsd:string	Optional	<behavior> <behaviorSec> <digiprovMD> <dmdSec> <file> <rightsMD> <sourceMD> <techMD>
LABEL	xsd:string	Optional	<behavior> <behaviorSec> <interfaceDef> <mdRef> <mdWrap> <mechanism> <mets> <structMap>
LASTMODDATE	xsd:dateTime	Optional	<metsHdr>
LOCTYPE (3)	xsd:string	Required	<FLocat> <interfaceDef> <mptr> <mechanism> <mdRef>
MDTYPE (4)	xsd:string	Required	<mdRef> <mdWrap>
MDTYPEVERSION	xsd:string	Optional	<mdRef> <mdWrap>
MIMETYPE	xsd:string	Optional	<file> <mdRef> <mdWrap>
OBJID	xsd:string	Optional	<mets>
ORDER	xsd:integer	Optional	
ORDERLABEL	xsd:string	Optional	

ATTRIBUTE	TYPE	OPTIONAL/ REQUIRED	ATTRIBUTE OF ELEMENT
OTHERLOCTYPE	xsd:string	Optional	<FLocat> <interfaceDef> <mptr> <mdRef> <mechanism>
OTHERMDTYPE	xsd:string	Optional	<mdRef> <mdWrap>
OTHERROLE	xsd:string	Optional	<agent>
OTHERTYPE	xsd:string	Optional	<agent>
OWNERID	xsd:string	Optional	<file> <fileType> <stream>
<PROFILE>	xsd:string	Optional	<mets>
RECORDSTATUS	xsd:string	Optional	<metsHdr>
ROLE (5)	xsd:string	Required	<agent>
SEQ	xsd:integer	Optional	<file>
SHAPE (6)	xsd:string	Optional	<area>
SIZE	xsd:long	Optional	<file> <mdRef> <mdWrap>
STATUS	xsd:string	Optional	<digiprovMD> <dmdSec> <rightsMD> <sourceMD> <techMD>
streamType	xsd:string	Optional	<stream>
STRUCTID	xsd:IDREFS	Optional	<behavior> <behaviorType>
TRANSFORMALGORITHM	xsd:string	Required	<transformFile>
TRANSFORMBEHAVIOR	xsd:IDREF	Optional	<transformFile>
TRANSFORMKEY	xsd:string	Optional	<transformFile>
TRANSFORMORDER	xsd:positiveInteger	Required	<transformFile>
TRANSFORMTYPE	xsd:string with value decompression or decryption	Required	<transformFile>

ATTRIBUTE	TYPE	OPTIONAL/ REQUIRED	ATTRIBUTE OF ELEMENT
TYPE	xsd:string	Optional	<altRecordID> <agent>(7) <mets> <structMap>
USE	xsd:string	Optional	<FContent> <file> <fileGrp> <FLocat>
VERSDATE	xsd:dateTime	Optional	<fileGrp>
xlink:actuate (8)	xsd:string	Optional	<smLink>
xlink:arcrole	xsd:string	Optional	<smLink>
xlink:from		Optional	<smLink>
xlink:label	xsd:string	Optional	<area>
xlink:simpleLink		Optional	<FLocat> <interfaceDef> <mechanism> <mdWrap> <mptr>
xlink:show	xsd:string	Optional	<smLink>
xlink:title	xsd:string	Optional	<smLink>
xlink:to	xsd:string	Optional	<smLink>
XPTR	xsd:string	Optional	<mdRef>

(1) Value must be one of the following: BYTE, IDREF, SMIL, MIDI, SMPTE-25, SMPTE-24, SMPTER-DF30, SAMPTE-NDF30, SMPTE-DF29.97, TIME, TCF

(2) Value must be on of the following: Adler-32, CRC32, HAVEL, MD5, MNP, SHA-1, SHA-256, SHA-384, SHA-512, TIGER, WHIRLPOOL

(3) Value must be one of the following: ARK, URN, URL, PURL, HANDLE, DOI, OTHER

(4) Value must be one of the following: MARC, MODS, EAD, DC, NISOIMG, LC-AV, VRA, TEIHDR, DDI, FGDC, LOM, PREMIS, PREMIS:OBJECT, PREMIS:AGENT, PREMIS:RIGHTS, PREMIS:EVENT, TEXTMD, METSRIGHTS, OTHER

(5) Value must be one of the following: CREATOR, EDITOR, ARCHIVIST, PRESERVATION, DISSEMINATOR, CUSTODIAN, IPOWNER, OTHER

(6) Value must be one of the following: RECT, CIRCLE, POLY

(7) Value must be one of the following: INDIVIDUAL, ORGANIZATION, OTHER

(8) Value must be one of the following: onLoad, onRequest, other, none

(9) Value must be one of the following: new, replace, embed, other, none